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SHEET FEEDING MECHANISM

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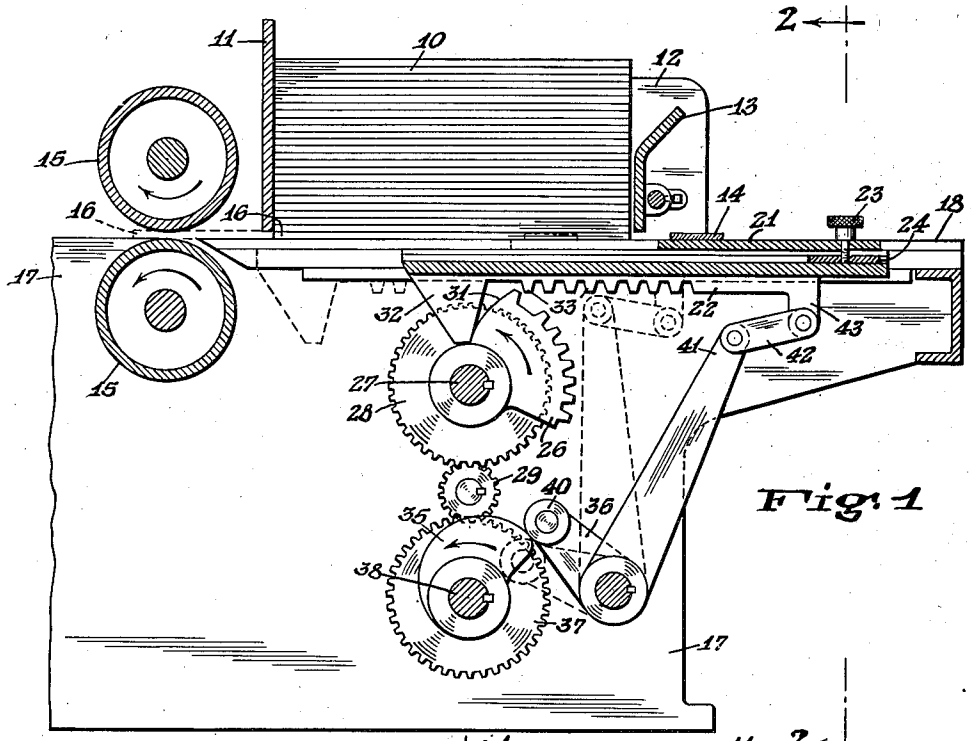


Fig. 1

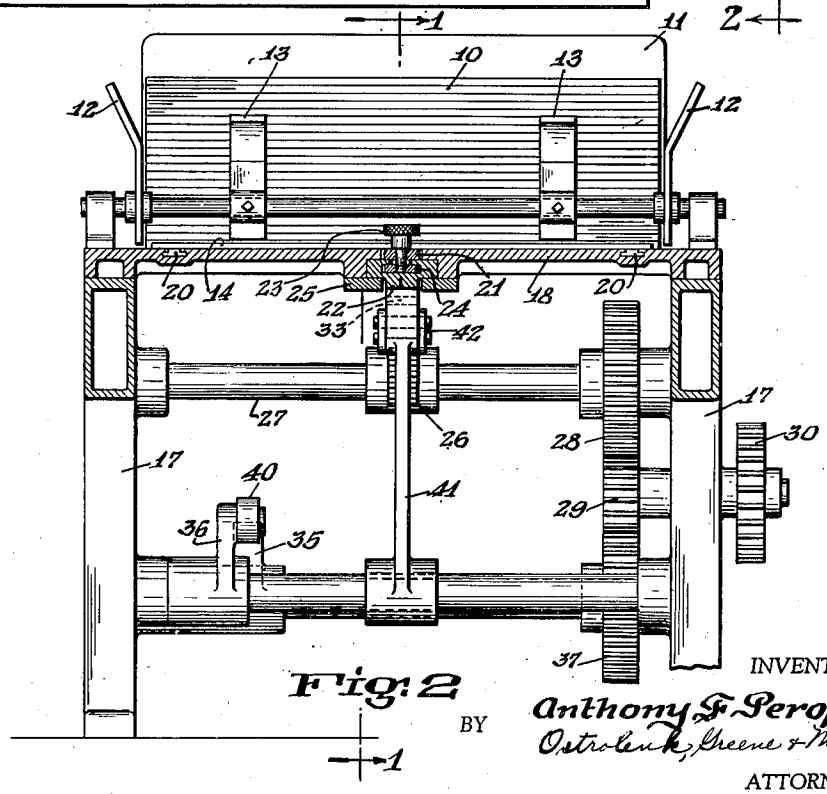


Fig. 2

INVENTOR.

Anthony F. Peropat

BY Ostrolenk, Greene & Marcus

ATTORNEY.

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SHEET FEEDING MECHANISM

Anthony F. Peropat, Brooklyn, N. Y., assignor to S. & S. Corrugated Paper Machinery Co., Inc., Brooklyn, N. Y., a corporation of New York

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8 Claims. (Cl. 271—44)

This invention relates to sheet feeding mechanisms and more particularly relates to a novel kicker mechanism for sheets of relatively stiff paper, for corrugated board, and the like.

Mechanisms operating upon sheets of corrugated board and the like are arranged with a kicker or sheet feeding mechanism which introduces one sheet at a time successively to the mechanism from a stack of the sheets arranged in a hopper.

It is among the objects of the present invention to provide a simple sheet feeding mechanism which advances the sheet at a continuous rate to the feed rollers.

Another object of my present invention is to provide a novel kicker operating at a constant speed.

Other objects of my present invention will become apparent in the following description of a preferred form of my invention illustrated in the drawing, in which:

Figure 1 is a horizontal cross-sectional view through the mechanism taken along 1—1 of Figure 2; and

Figure 2 is an end elevational view partly in section as viewed from 2—2 of Figure 1.

The individual stiff sheets are arranged in a stack 10 in a hopper comprising adjustable sides 11, 12 and 13 as is well known in the art. The kicker mechanism includes a transverse bar 14 arranged to abut the bottom sheet of the stack 10 and moved to the right to the coacting feed rolls 15—15 which rotate at a constant speed and introduce the bottom sheet 16 shown in dotted lines to the input of apparatus not shown but located to the left of Figure 1 as will be understood by those skilled in the art. The hopper and kicker mechanism are arranged upon the frame 17 in any convenient manner.

In accordance with my present invention, the kicker bar 14 is reciprocated across the bed 18 with a substantially constant forward or advancing speed. The constant forward speed, i. e., from right to left in Figure 1, occurs during the feeding of the bottom sheet 16. The kicker bar 14 is accurately guided by channel bars 20 riding in corresponding tracks in the bed 18 as seen in Figure 2. The center portion of the kicker bar 14 is secured to a rectangular bar 21 by welding, riveting or other means. The top surface of the bar 21 is flush with the top surface of the bed 18. Bar 21 is fastenable with respect to the rack member 22 by means of a thumb screw 23 along different portions of member 22 to permit the variable positioning of the kicker bar 14 with respect to the forward edge of the sheet stack 10.

The illustrated arrangement for securing bar 21 with respect to member 22 comprises a further bar 24 set within a groove within the rack member 22 and arranged parallel to the upper bar 21. The thumb screw 23 operates into a threaded portion in the bar 24 and through a clearance hole in the bar 21. Thus when screw 23 is tightened, bars 21 and 24 are pressed together upon rack member 22 with the overhanging portions of the groove gripped therebetween as illustrated in the cross-sectional view of Figure 2. The position of the kicker bar 14 is accordingly adjusted with respect to the rack member 22 by the simple expedient of loosening the thumb screw 23 and moving the bars 21 and 24 with respect to the rack member 22 until the kicker bar 14 is at the proper position somewhat ahead of the front edge of the stack 10 as will be evident to those skilled in the art. The movement of the bars 21 and 24 is possible due to the loosening of the screw member 23 which permits both bars to move with respect to the groove in rack member 22.

The rack member 22 is oscillated across the bed 18 and carries with it the kicker bar 14. Rack member 22 contains flanges which are guided within the bed 18 structure and maintained therein by a supplemental plate 25 enclosing the extending flanges of the member 22 as shown in Figure 2. In accordance with my invention, the rack member 22 is moved towards the left during the sheet feeding operation at a constant speed. I accomplish this result by means of the segment gear 26 which is fastened to a shaft 27 operated by suitable gearing 28, 29 and 30 from either the main drive source of the associated machine units or an independent drive motor.

Segment gear 26 contains an arcuate surface 31 which abuts the projecting section 32 located at the forward end of the rack member 22. The curvature of the arcuate portion 31 is designed to move rack 22 at a predetermined constant speed towards the left while surface 31 rolls against the coacting surface of the projecting portion 32 of rack 22.

Rack 22 contains teeth 33 arranged to coact with the teeth of the segment gear 26 as the arcuate surface 31 completes its coaction with projecting member 32. The teeth of segment gear 26 are arranged at a constant radial position from the center of shaft and coact with the rack teeth 33 to continue the movement of the

rack 22 at the same predetermined speed to the left which arcuate surface 31 effected.

It will now be evident that the feeding movement of rack member 22 towards the left is effected by the successive actions of the arcuate surface 31 of the segment gear 26 and the subsequent driving action of the teeth of the segment gear 26 with the teeth 33 of the rack. It is feasible to arrange the segment gear 26 to effect the constant speed of feeding of the sheets into the rollers 15 and to employ the initial movement of the rack 22 by the arcuate surface 31 merely as a starting movement for the rack. However, variations in the design of the segment gear 26 are feasible and will be evident to those skilled in the art.

The rack 22 is accordingly moved toward the left at a predetermined rate during the coaction of the segment gear 26 with the rack member. The transverse kicker bar 14 is mechanically secured to the rack member 22 in a manner hereinabove described and abuts the bottom sheet 16 of the stack 10 and moves sheet 16 at a constant speed between the feed rollers 15—15. The predetermined speed of movement of the rack 22 during feeding is preferably arranged to equal the peripheral velocity of the feed rollers 15 to avoid pulling of the sheets and provide a smooth and satisfactory feeding action by the rollers.

The return movement, towards the right, of the rack member 22 and therefore the kicker bar 14 is effected by means of a cam 35 which operates bell crank lever 36. Cam 35 is driven from the common gearing 29—30 which drives the segment gear 26 through a further gear 37 secured to shaft 38. Cam 35 is keyed to shaft 38. Cam follower 40 is secured to one end of the bell crank lever 36. The other end 41 of bell crank lever 36 is pivotally connected to a link 42 which in turn is pivotally connected to a lug 43 integral with the right end of the rack member 22.

Return cam 35 is designed to gradually and continuously move cam follower 40 radially outwardly with respect to shaft 38 between the intervals of sheet feeding. The illustrated position of the mechanism in Figure 1 is near the end of the return movement, to the right, of the rack 22 and just at the beginning of the feeding action, to the left. As bell crank lever 36 is rotated clockwise by cam 35, rack 32 is moved toward the right to its initial position as will now be evident to complete the cycle of feeding.

Segment gear 26 and cam 35 are both rotated in the same direction although not necessarily so, to alternately and successively effect the forward feeding action of the sheets through the kicker bar 14 and the return of the kicker bar 14 to its initial position. The forward feeding action to the left during the interval which the kicker bar 14 engages the bottom sheet 16 of the stack 10 is at a constant speed preferably equal to the peripheral speed of the feed rollers 15. The return motion of the kicker bar 14 need not be at a constant speed.

Although I have described a preferred form for carrying out my invention, it will be evident that modifications are feasible which fall within the broader spirit and scope of my invention and accordingly I do not intend to be limited except as set forth in the following claims.

I claim:

1. A sheet feeding mechanism comprising a hopper for carrying a stack of sheets and means for feeding a sheet of said stack at a substantially continuous rate including a kicker bar for coacting with an edge of said sheet, a rack member securable to said kicker bar, and means for motivating said rack member at a continuous rate in the feeding direction comprising a completely rotated segment gear having teeth cyclically coacting with said rack and a surface portion for initially motivating said rack member in the feeding direction before said teeth coact, said gear being disengaged from said rack during the return portion of the cycle.

2. A sheet feeding mechanism comprising a hopper for carrying a stack of sheets and means for feeding an outer sheet of said stack at a substantially continuous rate including a kicker bar for coacting with an edge of said sheet, a rack member securable to said kicker bar having teeth, and means for motivating said rack member comprising a segment gear having teeth for coacting with the rack teeth, means for rotating said segment gear to cyclically engage and disengage with said rack teeth and mechanism for returning said rack to its initial feeding position while disengaged from said segment gear.

3. A sheet feeding mechanism comprising a hopper for carrying a stack of sheets and means for feeding an outer sheet of said stack at a substantially continuous rate including a kicker bar for coacting with an edge of said sheet, a rack member securable to said kicker bar having teeth, and means for motivating said rack member comprising a completely rotated segment gear having teeth for cyclically coacting with the rack teeth, and means for returning said rack to its initial sheet feeding position and means for rotating said segment gear out of coaction with said rack and into its initial coacting position during the return movement of said rack.

4. A sheet feeding mechanism comprising a hopper for carrying a stack of sheets and means for feeding an outer sheet of said stack at a substantially continuous rate including a kicker bar for coacting with an edge of said sheet, a rack member securable to said kicker bar having teeth, means for motivating said rack member comprising a segment gear having teeth for coacting with the rack teeth, and means for returning said rack to its initial sheet feeding position comprising a bell-crank lever attached to said rack, and a cam operating against said lever after the sheet feeding portion of the operating cycle, and means for continuously driving said cam and said segment gear whereby said gear is disengaged from said rack while said bell-crank lever returns said rack to the initial sheet feeding position.

5. A sheet feeding mechanism comprising a hopper for carrying a stack of sheets and means for feeding the bottom sheet of said stack towards a pair of feed rollers at a substantially continuous rate including a kicker bar for coacting with an edge of said sheet, a rack member securable to said kicker bar, said rack member having teeth and a protruding surface portion, means for motivating said rack member comprising a segment gear having teeth for coacting with the rack teeth during the feeding portion of the operating cycle, a surface of said segment gear being arranged to coact with the rack protruding surface portion at the initial feeding portion of said operating cycle, said gear being disengaged from said rack during the return portion of the cycle.

6. A sheet feeding mechanism comprising a hopper for carrying a stack of sheets and means for feeding the bottom sheet of said stack towards a pair of feed rollers at a substantially continuous rate including a kicker bar for coacting with an

edge of said sheet, a rack member securable to said kicker bar having teeth, a protruding surface portion at one end of said rack, means for motivating said rack member comprising a segment gear having teeth arranged at a substantially equi-radial position on said gear for coacting with the rack teeth during the feeding portion of the operating cycle, the forward surface of said segment gear being arranged to coact with the rack protruding surface portion at the initial feeding portion of said operating cycle for motivating said rack before said gear teeth engage the rack teeth for initiating the continuous substantially constant advance of said kicker bar by said rack in feeding the sheet, said segment gear teeth being disengaged from said rack teeth at the end of the feeding portion and during the return portion of the cycle.

7. A sheet feeding mechanism comprising a hopper for carrying a stack of sheets and means for feeding the bottom sheet of said stack towards a pair of feed rollers at a substantially continuous rate including a kicker bar for coacting with an edge of said sheet, a rack member securable to said kicker bar having teeth, and a protruding surface portion at one end of said rack, means for motivating said rack member comprising a segment gear having teeth for coacting with the rack teeth during the feeding portion of the operating cycle, the forward surface of said segment gear being arcuate and arranged to coact with the rack protruding surface portion at the initial feeding portion of said operating cycle for motivating said rack at a continuous rate in the feeding direction before said gear teeth engage the rack teeth for initiating the continuous substantially constant advance of said kicker bar by said rack in feeding the sheet, said segment gear teeth being disengaged from said rack teeth at the end of the feeding portion and during the return portion of the cycle.

8. A sheet feeding mechanism comprising a hopper for carrying a stack of sheets and means for feeding the bottom sheet of said stack towards a pair of feed rollers at a substantially continuous rate including a kicker bar for coacting with an edge of said sheet, a rack member securable to said kicker bar having teeth, and a protruding surface portion at one end of said rack, means for motivating said rack member comprising a segment gear having teeth arranged at a substantially equi-radial position on said gear for coacting with the rack teeth during the feeding portion of the operating cycle, the forward surface of said segment gear being arranged to coact with the rack protruding surface portion at the initial feeding portion of said operating cycle for motivating said rack before said gear teeth engage the rack teeth for initiating the continuous substantially constant advance of said kicker bar by said rack in feeding the sheet, and means for returning said rack to its initial sheet feeding position comprising a bell-crank lever attached to said rack and a cam operating against said lever after the sheet feeding portion of the operating cycle, said segment gear teeth being disengaged from said rack teeth at the end of the feeding portion and during the return portion of the cycle.

ANTHONY F. PEROPAT.