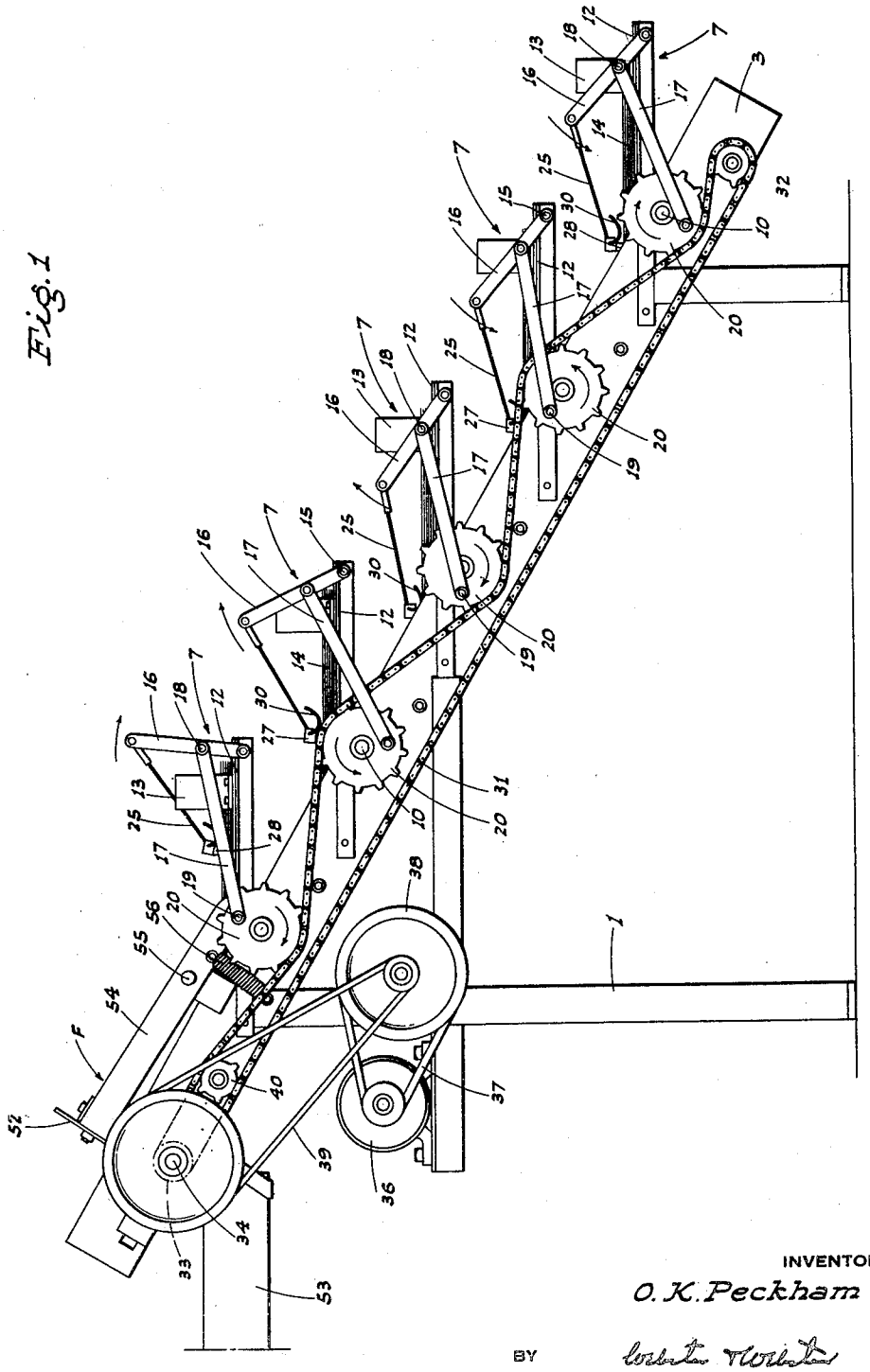
July 17, 1951 O. K. PECKHAM 2,561,223

RECIPROCATING SHEET FEEDING DEVICE

Filed Feb. 17, 1947 4 Sheets-Sheet 1

Fig. 1



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RECIPROCATING SHEET FEEDING DEVICE

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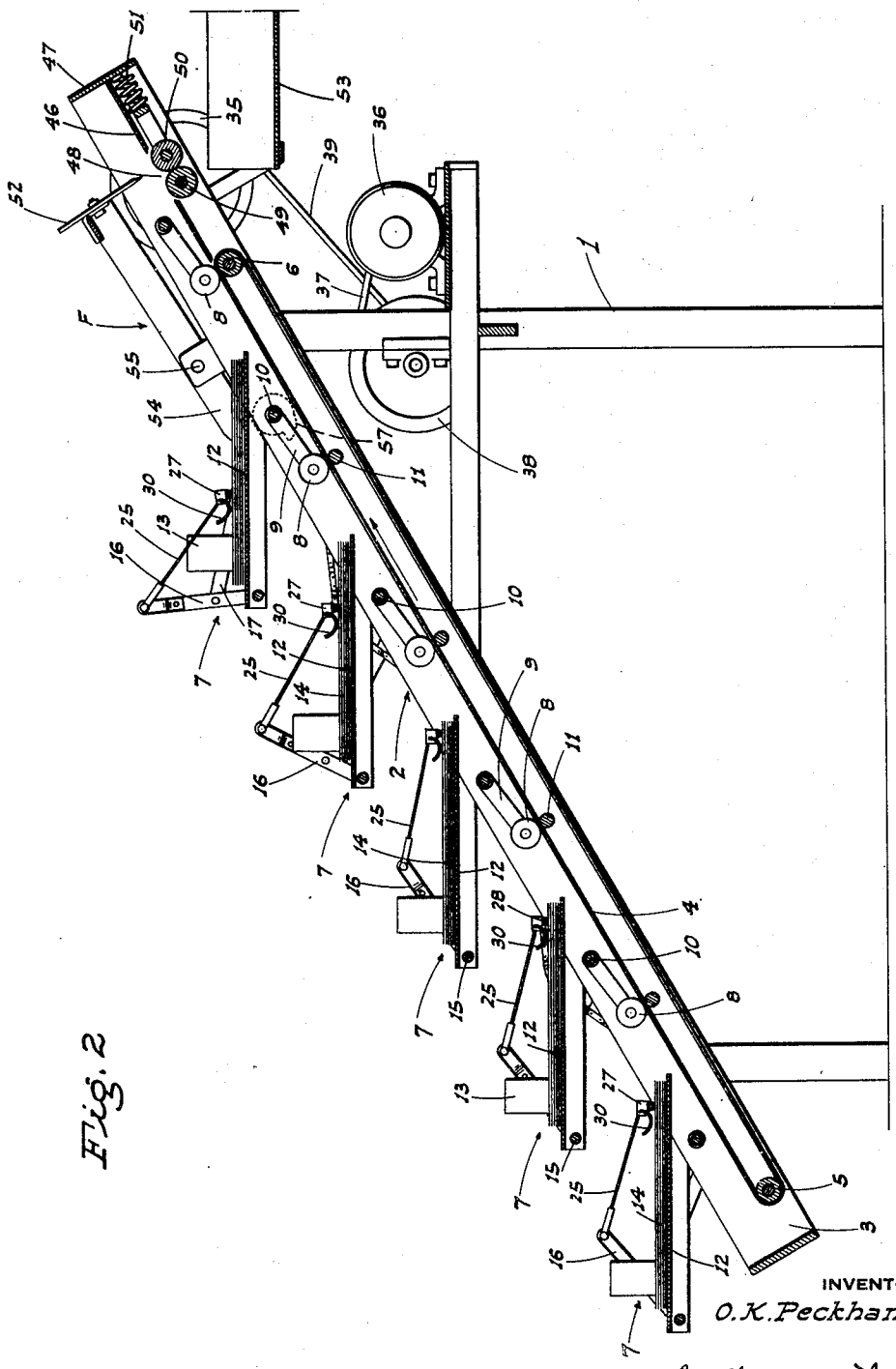


Fig. 2

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RECIPROCATING SHEET FEEDING DEVICE

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Fig. 3

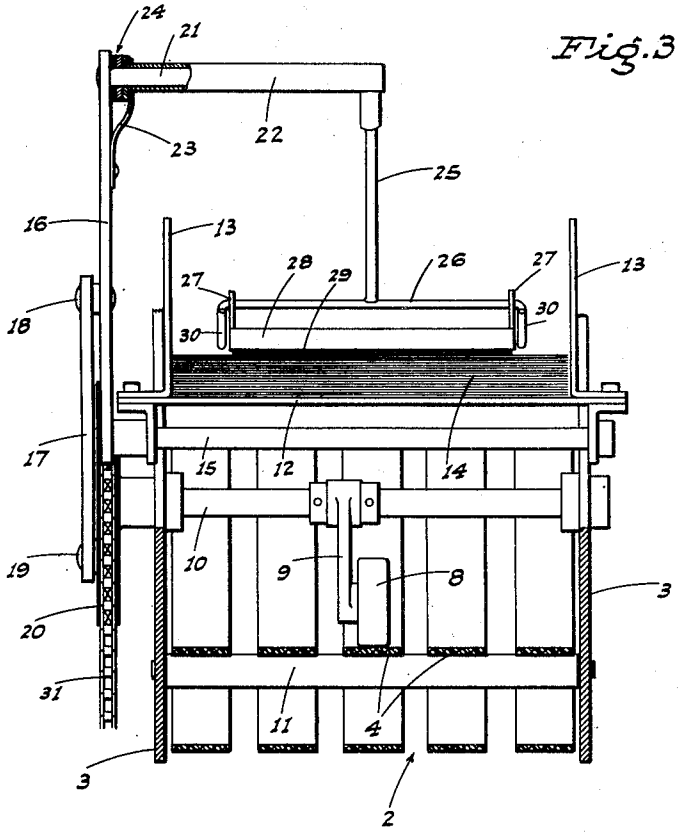
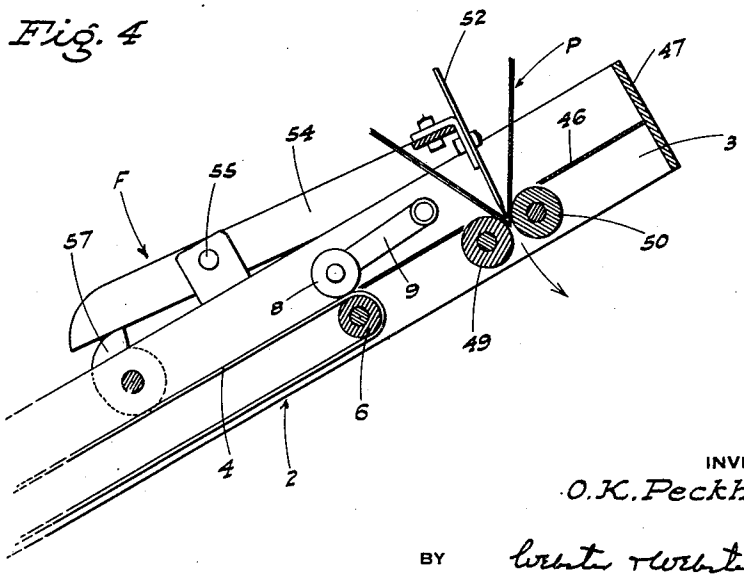



Fig. 4




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RECIPROCATING SHEET FEEDING DEVICE

Filed Feb. 17, 1947 4 Sheets-Sheet 4

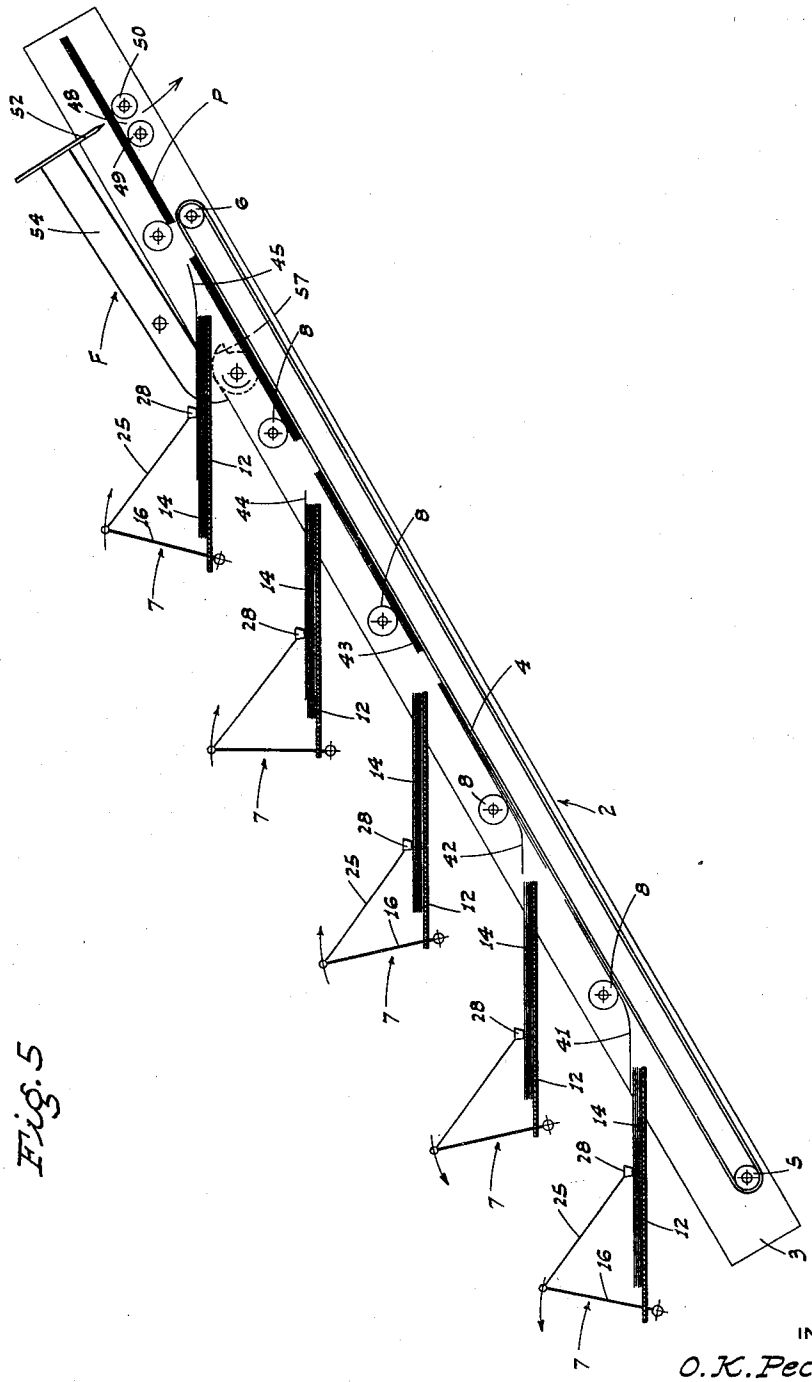



Fig. 5

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Patented July 17, 1951 2,561,223

# UNITED STATES PATENT OFFICE

2,561,223

## RECIPROCATING SHEET FEEDING DEVICE

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Application February 17, 1947, Serial No. 728,988

3 Claims. (Cl. 271—42)

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This invention relates generally to a machine for use by printers in connection with the collection of printed sheets.

In particular the invention is directed to, and it is an object to provide, a novel machine, operative to automatically assemble, in proper order and in matching engagement, printed sheets initially disposed in separate stacks; the machine being especially useful for the purpose of assembling the sheets of small newspapers, folders, pamphlets, or the like.

Another object of the invention is to provide a machine, of the character described, which is automatically operative to fold the assembled sheets half upon half where the publication is one which includes folded sheets.

A further object of the invention is to provide a machine, for assembling or collating printed sheets, which comprises an endless conveyor, a plurality of tables mounted in spaced relation lengthwise of and adjacent the conveyor adapted to each support a stack of printed sheets, and sheet feeding means operative, in timed relation to the conveyor, to feed individual sheets from the stacks at such times that with advance of the conveyor the sheets deliver in predetermined order and matching relation into spaced piles on said conveyor.

An additional object of the invention is to provide a novel, sheet pile folding unit, arranged adjacent the discharge end of the conveyor to act on the sheet piles to fold the same half upon half.

A further object of the invention is to provide a practical paper collator and folder, and one which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings:

Fig. 1 is a side elevation of the machine, as in use.

Fig. 2 is a longitudinal sectional elevation of the machine, looking from the opposite side.

Fig. 3 is an enlarged transverse section taken through the conveyor assembly and directly to the rear of one of the sheet feeding units.

Fig. 4 is an enlarged, fragmentary sectional elevation of the sheet folding unit.

Fig. 5 is a diagrammatic side elevation, illustrating the successive delivery of sheets, in timed order, onto the conveyor from each sheet feeding unit.

Referring now more particularly to the characters of reference on the drawings, the machine

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comprises an upstanding main frame 1 which supports an upwardly inclined, endless conveyor unit, indicated generally at 2; said conveyor unit comprising a pair of transversely spaced, parallel side beams 3 connected together in rigid relation, and a series of side-by-side, endless flexible tapes 4 are disposed between the side beams 3, being supported at opposite ends by rollers 5 and 6. The upper roller 6 is driven, in the manner hereinafter described, in a direction such that the upper runs of the endless tapes 4 travel in an upward direction, as shown by the arrow in Fig. 2.

The main frame 1 supports, at longitudinally spaced points, and above the tapes 4, a plurality of sheet feeding units, each of which is indicated generally at 7; said sheet feeding units 7 being disposed in stepped relation, as clearly shown in the drawings.

Directly ahead of each of the sheet feeding units 7 the endless conveyor unit 2 includes a centrally disposed, sheet hold-down roller 8 which cooperates with the central one of the tapes 4; each such roller being carried on the free end of a forwardly and upwardly inclined floating arm 9 which radiates, in relatively turnable relation, from a corresponding cross shaft 10 journaled at the ends in connection with the side beams 3.

Below the upper runs of the endless tapes 4 there are cross rods 11 fixed between the side beams 3 directly below the sheet hold-down rollers 8, whereby the upper runs of the tapes 4 are maintained in substantially straight-line relation throughout the length of the conveyor.

As each of the sheet feeding units 7 are of substantially identical construction, a description of one will suffice for all. Each such unit comprises a horizontal table 12, fixedly supported from the side beams 3 of the endless conveyor unit 2; such table including upstanding end plates 13 whereby to maintain a stack 14 of printed sheets on said table in proper position laterally thereof. Adjacent its rear end each table 12 is fitted, below the same, with a cross shaft 15 having an upstanding arm 16 fixed on one end thereof for oscillating movement in a vertical plane. This arm 16 is oscillated through a predetermined arc by means of a connecting rod 17 pivoted at one end to said arm intermediate the ends of the latter, as at 18, and thence extending at a forward and downward incline. At its lower end each connecting rod 17 is secured by an eccentric pin 19 to a sprocket 20 on the adjacent end of the cross shaft 10. Thus, upon rotation of each sprocket 20, the corresponding arm 16 is oscillated, which motion is

employed to feed the sheets, one at a time, forwardly from the top of the stack 14 by the following means:

At its upper end the oscillating arm 16 is fitted with a rigid, horizontal laterally inwardly projecting spindle 21 on which a sleeve 22 is turnably disposed; escape of the sleeve 22 from the spindle 21 being prevented by means of a spring 23. A friction washer unit 24 is disposed on a spindle 21 between the arm 16 and the adjacent end of the sleeve 22; this friction washer unit 24 serving a purpose as hereinafter described.

At its free or outer end the sleeve 22 is fitted with a forwardly and downwardly inclined thrust rod 25 having a transverse or T-head 26 on its lower end. The T-head 26 projects at opposite ends through ears 27 which are upstanding from a transverse block 28 of substantial length. The transverse block 28 is formed, on its lower surface, with a friction pad 29. Outwardly of the ears 27 the ends of the T-head 26 turn rearwardly and are formed as upwardly curved skids 30.

The sprockets 20 are simultaneously driven by an endless chain 31 which extends along the endless conveyor unit 2 on the outside thereof adjacent said sprockets; the upper run of said chain meshing with the sprockets in over and under relationship, whereby to provide of positive tooth-chain engagement at all times. At its lower end the chain transverses an idler sprocket 32, while at its upper end said chain traverses, and is driven by, a sprocket 33 on a cross shaft 34. The cross shaft 34 is driven by a pulley 35; said pulley 35 being actuated from an electric motor 36 on the main frame 1 through the medium of an endless belt 37, a speed-reduction unit 38, and another endless belt 39, all coupled together, as shown in Fig. 1.

The driven roller 6 is actuated from the chain 31 by a sprocket 40 on one end of the shaft of said roller.

The connecting rods 17 are secured by the eccentric pins 19 to the sprockets 20 at such points that the sheet feeding units 7 are actuated in predetermined timed relationship, to the end that the following result is accomplished.

As the machine operates the lowermost sheet feeding unit 7 functions, upon oscillation of its arm 16, to advance the topmost sheet from the corresponding stack 14 forwardly toward the upper run of the tapes 4. The corresponding roller 8, in cooperation with the central tape 4, engages and advances said sheet, indicated at 41, in the manner illustrated in Fig. 5. This sheet 41 is thus delivered to the endless conveyor unit 2 and begins its upward travel. As such sheet reaches a predetermined point in relation to the other and following ones of the sheet feeding units 7, the latter function successively to feed other sheets 42, 43, 44, and 45 in stacked matching relation thereon. In this manner there is a successive and predetermined piling of the sheets onto the upper run of the endless conveyor 2, whereby to collate the sheets from the several stacks 14 into completed sheet piles wherein the sheets bear a predetermined relationship to each other.

Each of the sheet feeding units 7 functions generally in the following manner:

Starting from a retracted position the oscillating arm swings forwardly, advancing the sleeve 22, thrust rod 25, and the connected transverse 28 with its friction pad 29. On this advancing stroke the friction pad 29 oscillates the uppermost



sheet 14 forwardly a corresponding distance for engagement and movement by the conveyor, as previously described. The oscillating arm 16 then swings rearwardly in a retracting stroke, and during this stroke undesirable rearward sliding of the top sheet of the corresponding stack 14 is prevented by a slight lifting of the friction pad 29. This is accomplished by the friction washer unit 24, whose friction tends to cause a slight rising motion of the transverse block 28 and pad 29 as the arm traverses its retracting stroke. Simultaneously, the skids 30 may bear on such upper sheet in easy sliding relation.

After the progressive formation or collation of the sheet piles on the endless conveyor 2, each completed pile, as indicated at P, passes off the upper end of the conveyor onto a sheet folding unit, indicated generally at F. This unit comprises a receiving table 46 having an end stop 47. The receiving table 46 is formed with a central transverse slot 48, through which a pair of cooperating transverse rollers 49 and 50 are exposed; said rollers being supported between the side beams 3. The roller 49 is driven to turn in the direction shown by the arrow in Fig. 5, as such roller is formed on the cross shaft 34. The other roller 50 is spring-urged, by a mount, indicated at 51, yieldably toward the driven roller 49.

The receiving table 46, together with the described assembly of the rollers 49 and 50, form part of the sheet or stack folding unit, which additionally includes a vertically reciprocable transverse bending blade 52 normally disposed above, but adapted to project between, the rollers 49 and 50.

As each completed pile P of the sheets is deposited on the receiving table 46, the blade 52 acts in timed relation to swing downwardly into engagement with such pile P centrally of its ends. With continued movement in such direction the blade forces such pile at the engaged transverse line between the rollers 49 and 50, as shown in Fig. 4, which rollers complete the folding operation and deliver the folded sheet pile P into a catch tray 53 supported below the upper end portion of the endless conveyor 2.

The bending or folding blade 52 is mounted and actuated for the above operation as follows:

The blade 52 is mounted, transversely of the endless conveyor 2, on the forward end of a longitudinally extending walking beam 54 pivoted, intermediate its ends, as at 55, to one of the side beams 3; there being a tension spring 56 connected to said walking beam in a manner to normally raise the blade 52. A rotary cam 57 on the adjacent end of one of the driven cross shafts 15 works in cooperative relation to the rear end portion of the walking beam 14; said cam being operative to work the walking beam 54 and the bending blade 52 in the necessary timed relation to the operation of the endless conveyor and associated sheet feeding units 7.

With the above described machine printed sheets may be collated in an effective, convenient and automatic manner; the resultant sheet piles being automatically folded before delivery from the machine, the machine functioning very accurately and at substantial speed, so that it effects a material saving in time and labor.

At the same time, it will be evident that by disengaging or eliminating the blade from the structure, the machine may be employed to deliver the collated sheets unfolded into a tray, as may be desirable in certain circumstances.

Also, another blade and folding roller unit may be arranged in position to receive the once-folded piles of sheets, and by operation in properly timed relation to the initial folding unit subject such piles to a further folding operation. By so doing, papers of certain sizes will then be ready for insertion into envelopes if desired.

From the foregoing description it will be readily seen that there has been produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention the following is claimed as new and useful, and upon which Letters Patent are desired:

1. A sheet feeding unit comprising a table adapted to support a stack of sheets, an arm upstanding adjacent one side of the table mounted for oscillation in a longitudinal vertical plane, a supporting rod fixed on the arm and projecting laterally inward over the table and stack theron, a sleeve turnably but axially immovably mounted on the supporting rod, a friction washer unit between adjacent parts of the sleeve and arm, a thrust rod extending from the sleeve at a forward and downward incline above said table and stack, a transverse block secured to the lower end of the thrust rod, a friction pad on the bottom of the transverse block, and rearwardly extending skids on the block at spaced points, the friction pad acting to feed the top sheet of the stack on each advancing stroke of the thrust rod and the skids tending to ride the next uppermost sheet with the pad clear thereof upon the following retracting stroke of said thrust rod.

2. A sheet feeding unit comprising a table adapted to support a stack of sheets, an arm upstanding adjacent the table and mounted at its lower end for oscillation in a longitudinal vertical plane, a thrust rod projecting downwardly from the arm for reciprocation thereby above the stack, a pivot connection between the arm and rod, a friction pad on the lower end of the rod



to engage and advance the top sheet of the stack on the advancing stroke of the rod, and a yieldable friction drag acting on the rod to prevent free turning of the same about its pivot connection and cause the rod to lift from the sheet upon the retracting stroke of the arm and rod; said pivot connection comprising a transverse spindle on the arm and a sleeve on the rod turnable on the spindle, and said friction drag comprising a friction washer disposed on the spindle between the arm and sleeve, and a spring mounted on the arm and acting on the sleeve to shift the same axially and press the same against the washer.

3. A sheet feeding unit comprising a table adapted to support a stack of sheets, an arm upstanding adjacent one side of the table and mounted for oscillation in a longitudinal vertical plane, a supporting rod fixed on the arm and projecting laterally inward over the table and stack thereon, a sleeve turnably but axially immovably mounted on the supporting rod, a friction washer unit between adjacent parts of the sleeve and arm, a thrust rod extending from the sleeve at a forward and downward incline above said table and stack, and a friction pad on the lower end of the thrust rod adapted to engage and advance the top sheet of the stack on the advancing stroke of said thrust rod.

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