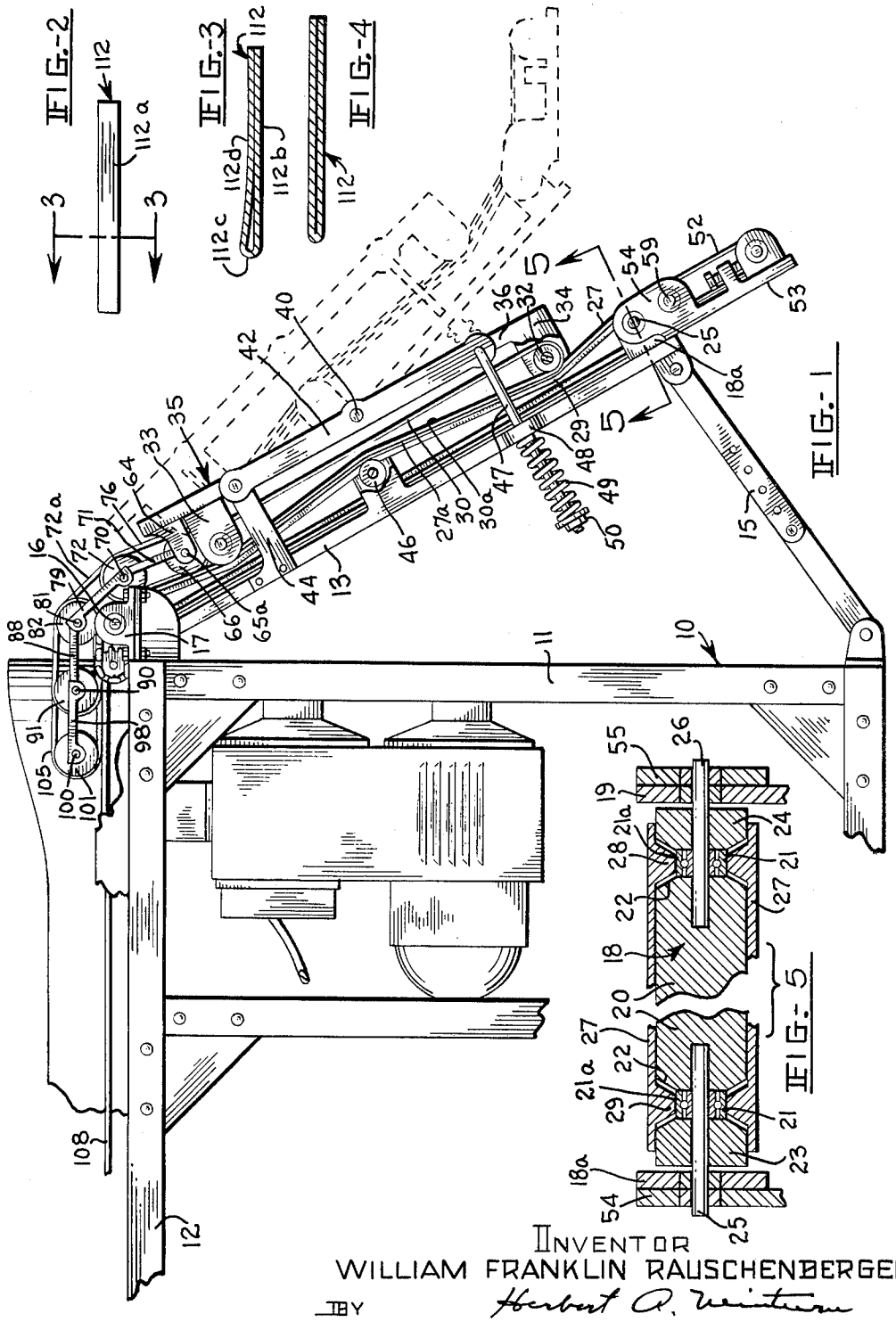
March 8, 1966 W. F. RAUSCHENBERGER 3,239,214

SIGNATURE FEEDER TO STACKER

Filed Aug. 21, 1963 3 Sheets-Sheet 1



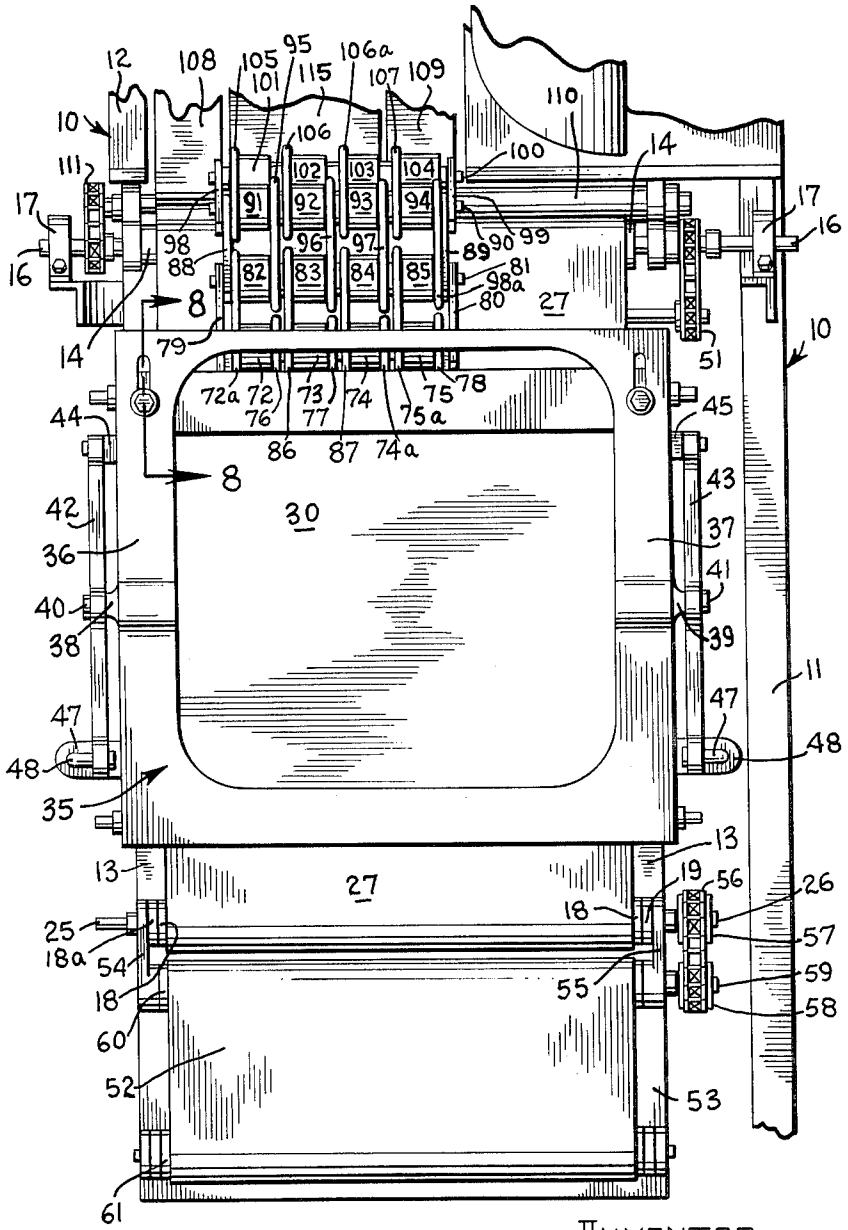
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SIGNATURE FEEDER TO STACKER

Filed Aug. 21, 1963 3 Sheets-Sheet 2

FIG. - 6



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SIGNATURE FEEDER TO STACKER

Filed Aug. 21, 1963 3 Sheets-Sheet 3

FIG. 7

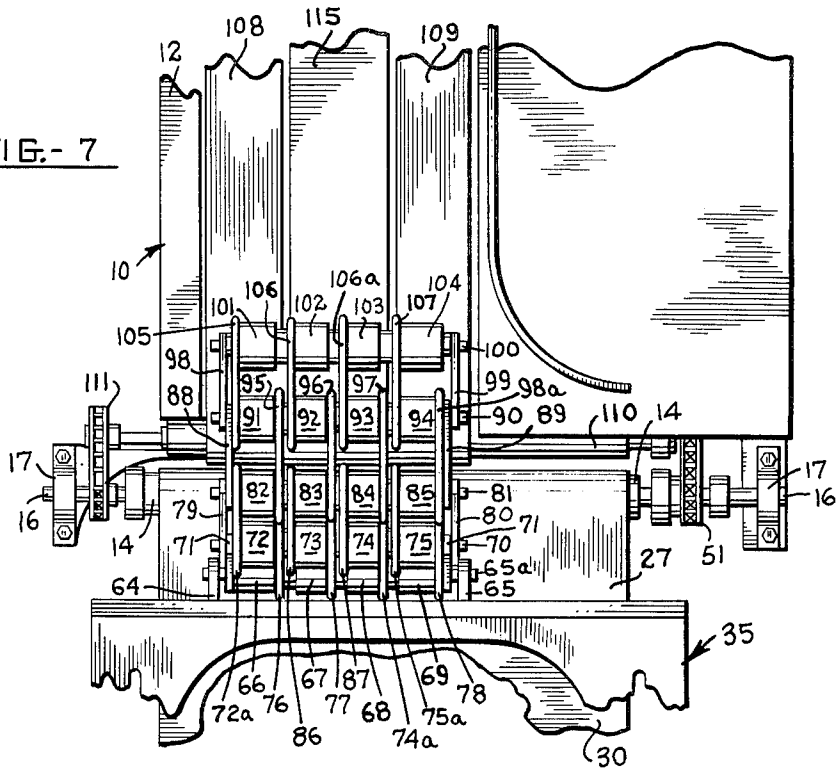
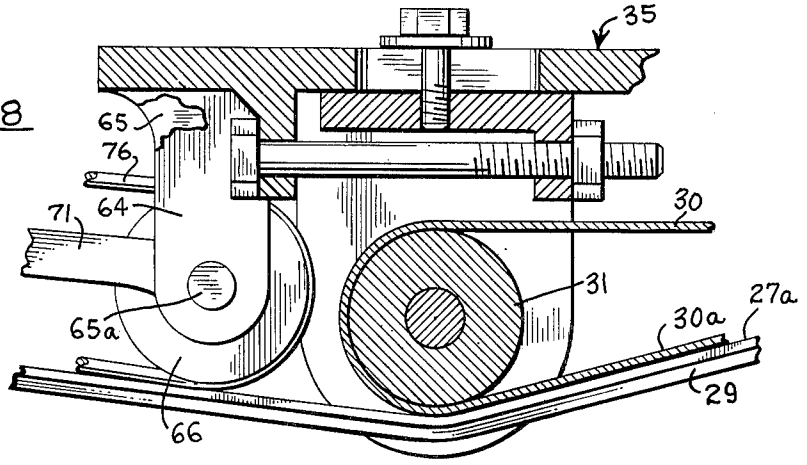


FIG. 8



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3,239,214

SIGNATURE FEEDER TO STACKER

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4 Claims. (Cl. 271—45)

This invention relates to a conveying mechanism for feeding sheets of material in flat form or as signatures wherein there is a fold along one edge of the paper. The invention is of particular advantage in feeding the signatures wherein the signatures are not only fed toward a stacker, but are also creased so that the two sections of the paper extending from the fold are in parallelism by reason of the fold having been compressed.

A further important object of the invention is to provide a mechanism wherein the material being conveyed is firmly gripped for movement in one portion of the conveyor, particularly where the sheets are being elevated. A further important object of the invention is to provide means for compressively gripping the sheets between two belts and to drive the belts in a straight line action without any tendency of the belts to assume an angular travel in relation to the intended direction of travel.

A still further important object of the invention is to provide an extremely simple mechanism which will be comparatively light in weight and may be readily connected to a stacker or other receiving device, or where the mechanism may be directly connected to a stacker such as is shown and described in my Patent No. 2,793,857 issued May 28, 1957.

As has been indicated, the conveying of the signatures or sheets of paper may be done equally as well at any angle to the horizontal as well as on a horizontal plane.

A still further object of the invention such as the uniqueness of the gripping of the sections being fed, and also a follow-up compressive guiding structure which have weight rollers rotated by interconnecting belts riding on the signatures themselves.

These and many other objects and advantages of the invention will become apparent to those versed in the art in the following description of one particular form of the invention as illustrated in the accompanying drawings, in which

FIG. 1 is a view in side elevation of a structure embodying the invention;

FIG. 2 is a view in folded edge elevation of a signature prior to being fed through the device constituting the invention;

FIG. 3 is a view in vertical section on the line 3—3 in FIG. 2;

FIG. 4 is a like section on the line 3—3 in FIG. 2 after the signature has been fed through the conveying device illustrating the collapsed or compressed fold;

FIG. 5 is a detail in section on the line 5—5 on an enlarged scale in FIG. 1 illustrating a drive belt idler roller;

FIG. 6 is a view elevation from a feeding side;

FIG. 7 is a detail in top plan view of the signature transfer mechanism from an elevating belt to a substantially horizontal feeding belt system; and

FIG. 8 is a view on an enlarged scale in detail on the line 8—8 in FIG. 6.

A fixed frame generally designated by the numeral 10 is formed to have a vertical end frame 11, from the upper end of which extends substantially horizontally a frame 12. An inclined bed 13 is rockably supported from the frame 10 to swing about an axis of a roller 14, the details of the connection of the bed 13 with that roller not being shown since they do not enter into the invention per se. It is sufficient to point out that this bed 13 may be rocked from a downwardly hanging position to a substantially horizontal position swinging through various intermediate

positions such as is indicated by the dash lines, FIG. 1. The angularity of the bed 13 in respect to the member 11 may be fixed as selected by means of the support 15 attached to the lower or outer end of the bed 13 and to the lower end of the frame 10. The roller 14 is mounted on a through shaft 16 revolubly carried by a bracket 17 extending from the frame 10 at each side thereof. A second roller is revolubly mounted at the opposite end of the bed 13, FIG. 6, to be revolubly carried between the brackets 18*a* and 19 fixed on opposite sides of the bed. These two rollers 14 and 18 are identical, and are shown in detail in section in FIG. 5. Each roller is divided into three lengths, a main central length 20 having a bearing 21 at each end thereof, the diameter of which bearing is less than the diameter of the roller length 20 The ends of the roller 20 have a bevel 22 sloping from the outer circumferential portion of the roller length down to the bearing 21 as indicated in FIG. 5. On each outer side of the bearing 21 are the other portions of the roller 23 and 24, having the same diameter as the roller length 20, and abutting the bearing 21 in each instance and sloping diagonally upwardly and outwardly therefrom. The roller 18 has a pair of stub shafts 25 and 26 coaxially extending through the members 23 and 24, the bearings 21, and into ends of the roller central length 20. Of course the roller 14 above indicated may have the stub shafts in place of the through shaft.

A belt 27 extends around the two rollers 14 and 18 in an endless manner, traversing substantially the entire length of the bed 13. A peculiarity of this belt 27 is that it has a pair of V-belts 28 and 29 fixed to its inner side and extending entirely therearound, being so located that one belt 28 will ride on one bearing 21 and the other on the other bearing 21, fitting down into the annular groove so formed between the ends of the roller lengths 20 and the outer ends 23 and 24. Of course the bearing 21 in each instance may be a roller bearing or as indicated in FIG. 5 a ball bearing, the main requirement being that the outer raceway 21*a* will be revoluble in reference to the shaft stubs 25 and 26.

Due to the presence of these two V-belts 28 and 29, the belt 27 is constrained to straight line travel over the bed 13 and around the two rollers 14 and 18.

A pressure belt 30 extends around rollers 31 and 32 which are rotatably carried by downturned arms 33 and 34 respectively extending from a rocker frame 35. This frame consists generally of a rectangular, centrally open member having side lengths 36 and 37 with a central boss 38 and 39 extending outwardly respectively from the sides 36 and 37. The frame 35 is rockably supported on pins 40 and 41 passing through arms 42 and 43, these arms in turn being rockably supported on upturned legs 44 and 45 located near the upper end portion of the bed 13 and being fixed thereto.

Normally the frame 35 will tend to drop toward the bed 13, and carry the belt 30 toward the belt 27. This is the intended operation in order that the under flight of the belt 30 will compressibly ride along with the upper flight of the belt 27. Now in order to increase the gripping action between those two belt flights, there is an idler roller 46 carried by the bed 13 to extend between the upper and lower flights of the belt 27, this roller 46 being a duplicate of the roller 18 illustrated in FIG. 5. The upper flight 27*a* of the belt 27 rides over the topside of this roller 46. In so doing, this flight 27*a* presses the under flight 30*a* of the belt 30 upwardly as illustrated in FIG. 1. Increase in pressure between those flights 27*a* and 30*a* may be had by having a rod 47 rockably engage the outer free end of the arm 42 and pass downwardly through ears 48 on the bed 13 and axially through coil springs 49 to have nuts 50 screw-threadedly engage end portions extending beyond the springs so that by run-

ning the nuts 50 upwardly along the rods 47, the springs 49 tend to be compressed to pull the arms 42 downwardly and thus carry the frame 35 downwardly.

The belt 27 is driven to have its top flight 27 travel upwardly as viewed in FIG. 1 by any suitable means, herein shown as by having a chain 51 passing around the roller shaft 16 and extending to some power source such as a motor not shown. The belt 27 in turn serves as a means to drive through the roller 18 an auxiliary platform belt 52 which is mounted on a subframe 53 rockably mounted on the stub shafts 25 and 26 by means of ears 54 and 55 respectively. That is, the member 53 may be rocked about those shafts from the substantially parallel alignment with the bed 13 to some other position as indicated by the dash lines in FIG. 1. The belt 52 is thus driven from the stub shaft 26 by means of a chain 56 wrapped around a sprocket 57 on the shaft 26 and a sprocket 58 on a shaft 59 on which a roller 60 is mounted carrying the belt 52 at one of its ends and driving the belt around an opposite roller 61 likewise revolubly mounted on the member 53.

The frame 35 has a pair of spaced apart, downturned feet 64 and 65, between which extends a shaft 65*a*, FIG. 8, and on which is carried a plurality of sets of individual rollers revolubly mounted, herein shown as five sets in number. These rollers are designated by the numerals 66, 67, 68 and 69. There is a second shaft 70 spaced from the shaft 65*a* by means of a plurality of links 71, one extending from the shaft 65*a* on each outer side of the rollers 66 and 69, there being two of these links as illustrated in FIG. 7.

Between each pair of links 71 is a second set of rollers 72, 73, 74, and 75. The links 71 in each instance rockably engage the shaft 70, such as by having the shaft 70 extending through end portions thereof. The links 71 are likewise rockably carried by the shaft 65*a*. The rollers 66 and 72 have a round belt 76 entrained therearound; the rollers 67 and 73 have a belt 77 entrained therearound; the rollers 68 and 74 have an interconnecting belt 74*a*; and the rollers 69 and 75 have a belt 78 entrained therearound.

Connecting links 79 and 80 are rockably carried by end portions of the shaft 70 respectively and in turn are rockably carried by their other ends by a shaft 81. The shaft 81 has revolubly carried thereon individual rollers 82, 83, 84, and 85. A round belt 86 is entrained around the rollers 73 and 83; a round belt 87 is entrained around the rollers 74 and 84. A belt 75*a* is entrained around rollers 75 and 85. A belt 72*a* is also entrained around the rollers 72 and 82.

Outside links 88 and 89 rockably carried by end portions of the shaft 81 adjacent the links 79 and 80 in turn rockably carry a shaft 90. The shaft 90 carries revolubly thereon individual rollers 91, 92, 93, and 94 between those links 88 and 89. Rollers 82 and 91 are interconnected by an encircling round belt 95. A belt 96 interconnects rollers 83 and 92. Belt 97 encircles the rollers 84 and 93 and belt 98*a* encircles the rollers 85 and 94. Finally, links 98 and 99 rockably carried on the shaft 90 outer ends rockably carry by their other ends a shaft 100 in turn carrying revolubly individual rollers 101, 102, 103, and 104. The rollers 91 and 101 are interconnected by a round belt 105; the rollers 92 and 102 are interconnected by the belt 106; the rollers 93 and 103 are interconnected by the belt 106*a*; and the rollers 94 and 104 are interconnected by the belt 107.

In each instance all of these round belts which have been indicated extend outwardly beyond the circumferential surfaces of the individual rollers, and normally ride in each instance initially on the upper end of the belt 27, FIGS. 6 and 7, and then on two conveying belts 108 and 109, FIGS. 6 and 7. This construction being hinged one set of rollers to the other through the side links, normally swings downwardly from the shaft 65*a*, and the belts accommodate themselves to the change in slopes of the belt 27 and the belts 108 and 109, and rotation of the various interconnected rollers is set up by the belts, these rollers being employed simply to maintain pressure of the round belts on the main supporting belts 27, 108 and 109.

The two belts 108 and 109 are entrained around a drive roller 110 driven by a chain 111 from the shaft 16. These two belts 108 and 109 lead substantially horizontally across the upper side of the frame 10 to the delivery point of the signatures, such as to a stacker (not shown). A supporting plate 112 is positioned between the belts 108 and 109, the topsides of the belts 108 and 109 and the plate 115 being in substantially the same plane.

Operation

Assuming for example that signatures 112, FIGS. 2–4, are to be conveyed, these signatures in the folded form as indicated in FIGS. 2 and 3 will be fed from the belt 52 which serves as an intermediary belt between a conveyor carrying the signatures thereto and the other mechanism above described. Normally these signatures will approach the belt 52 with the folded end 112*c* leading.

One signature at a time will be fed across the belt 52 to be carried onto the lower end of the top flight of the belt 27 where the edge 112*c* will be carried under the lower end of the belt 30 whereby the signature will be pressed between those two belts and firmly gripped to carry the signature in each instance between the two belts, that is, between the belt flights 30*a* and 27*a* where the folds 112*a* will be compressed from the loose fold as indicated in FIG. 3 to the tight, creased fold as indicated in FIG. 4 so that the signatures from then on will occupy less space when stacked one upon the other. The lower belt 27 carrying the V-belts 28 and 29 is constrained to straight line travel without lateral shifting of the belts across the rollers around which it is entrained. Thus the signature one after another is firmly gripped and carried along between the two belts to the upper end of the belt 27 where the round belts of the five sets of weight rollers press their carried round belts firmly against the oncoming signatures so as to grip them between the round belts and the belt 27 initially and then carry the signature around over the extreme upper end of the belt 27 and onto the substantially horizontally traveling belts 108 and 109. In this manner, the signatures are firmly engaged to carry them around the bending line of travel from the belt 27 to the belts 108 and 109 all without change in lateral positions of the signatures in that travel. The round belts maintain the travel of the signatures in the same straight line directions as initially set up between the belts 27 and 30. As above indicated, the belts 108 and 109 carry the signatures along to a stacker (not shown).

Further, it is to be emphasized that the V-belt arrangement on the belt 27 is such that its outermost face parallel with the belt 27 rides in each instance upon the outer race 21*a* of the bearing 21 in each instance, and that there is a slight clearance between the inclined sides of the V-belt 29 and the inclined sides 22 of the belt carrying rollers. Only in this operation was it discovered that straight line travel of the belt 27 is had without breakage of the V-belts 29 under the superimposed load of the flat belt 27 on these V-belts 29. The belt 27 carries the main driving load.

Thus one of the vexing problems in printing plants is solved very uniquely by the structure above described without having to employ manual labor normally slowing down the operation in this particular step of transferring the signatures from the printing and initial folding operation site to have the signatures creased in their folds and carried in straight line directions up an inclined belt and thence turned around into more or less a substantially horizontally travel alignment without permitting the signatures to get cross-wise or tend to do so in that particular travel.

Therefore while I have shown my invention in the one particular form, I do not desire to be limited to that precise form beyond the limitations which may be imposed by the following claims.

I claim:

1. For conveying and feeding of flexible materials such as signatures, the combination of

a frame;

a first belt carrier rockably carried by said frame;

an upper roller revolubly carried by said carrier;

a lower roller carried by said carrier spaced therealong from said upper roller;

each of said rollers having at least two circumferential grooves one spaced from the other laterally along the rollers, the grooves of one roller being in alignment with the grooves of the other roller on lines substantially normal to the axes of the rollers;

a first belt entrained around said rollers;

V-belts fixed to said belt and received within said grooves;

a third roller carried by said frame intermediate said upper and lower rollers with the axes of all three rollers being approximately in the same plane; said third roller having spaced apart grooves therearound in alignment with said V-belts and said grooves of the upper and lower rollers, and receiving said V-belts thereacross;

a second belt carrier;

a pair of levers laterally spaced apart and rockably carried by said first carrier;

a pair of rollers extending laterally across and one at each end of said second carrier, both of the second carrier rollers being disposed apart less than the spacing apart of the upper and lower rollers;

said second frame being rockably supported by said levers on an axis intermediate axes of said upper and lower rollers;

a second belt entrained around said second carrier rollers;

said second carrier normally rocking said levers and dropping under influence of gravity to have an under flight of the second belt bear against the top flight of the first belt;

yielding means compressively urging said second carrier downwardly bending said first belt flight downwardly by said second belt over said third roller between it and the upper and lower rollers; and

means driving said first belt.

2. The structure of claim 1, in which there is

an exposed top end portion of said first belt beyond said second belt;

a series of pairs of weight rollers; one initial pair of weights in said series being rockably attached to said second carrier to have rollers of the initial pair

adjacent the second carrier dropping by gravity influence toward said first belt exposed portion;

rockable links interconnecting said weight pairs;

a plurality of belts entrained about weight rollers in said pairs and about adjacent rollers of one pair and of the next pair; and

said weight belts extending radially beyond the peripheral surfaces of the weight belts to provide material traveling contacting members carrying said material to beyond said first and second belts.

3. The structure of claim 2, in which there is

belt conveying means having a top belt flight traveling away from adjacent the first belt as it travels around said upper roller; and

at least a pair of said weight rollers drop by gravity influence toward and over a portion of said belt mean flight adjacent said first belt.

4. The combination, in a conveyor of discrete approximately flat articles, of

a primary, material supporting belt having top and bottom flights;

a pressure belt having a bottom flight adjacent said primary belt top flight;

pressure belt rollers spaced apart a less distance than the length of said primary belt top flight, and around which rollers the pressure belt is entrained;

an intermediate roller across and under said primary belt top flight;

means urging said pressure belt flight compressively against said primary belt top flight and bending both flights over said intermediate roller;

means driving said primary belt;

said articles being deposited onto said primary belt and carried between said belt flights to be compressively gripped therebetween and transported to discharge beyond said pressure belt;

a second belt means having a flight moving away the said primary belt discharging portion;

rolling weight means rockably fixed at one end portion thereof;

pressure belts in said second belt means engaging said articles by said last belts bearing on said articles and pressing them against said moving flight; and

said weights being free to drop under influence of gravity and being rotated by said pressure belts bearing on said articles.

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