Jan. 11, 1966 H. W. HUFFMAN 3,228,273

SHEET DELIVERY MECHANISM

Filed Nov. 30, 1962 6 Sheets-Sheet 1

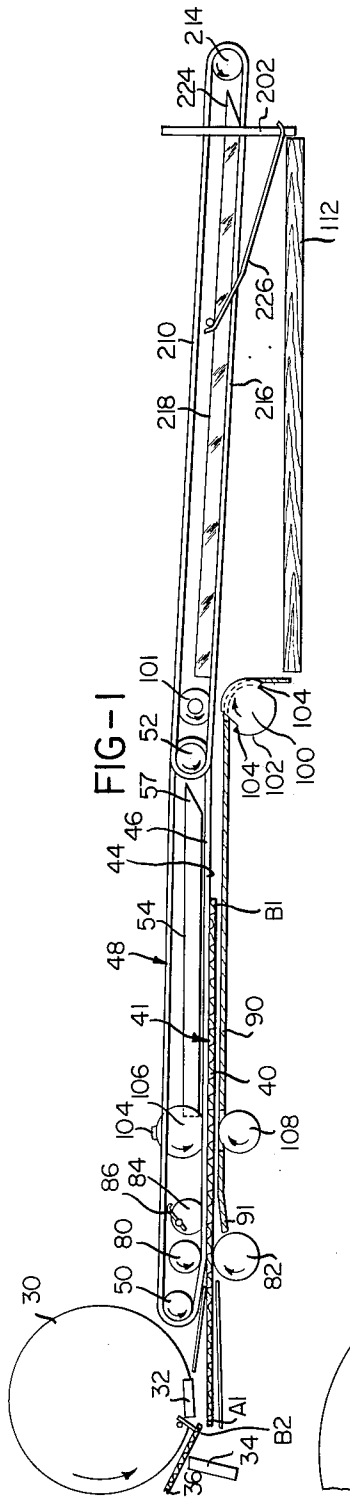

FIG-1

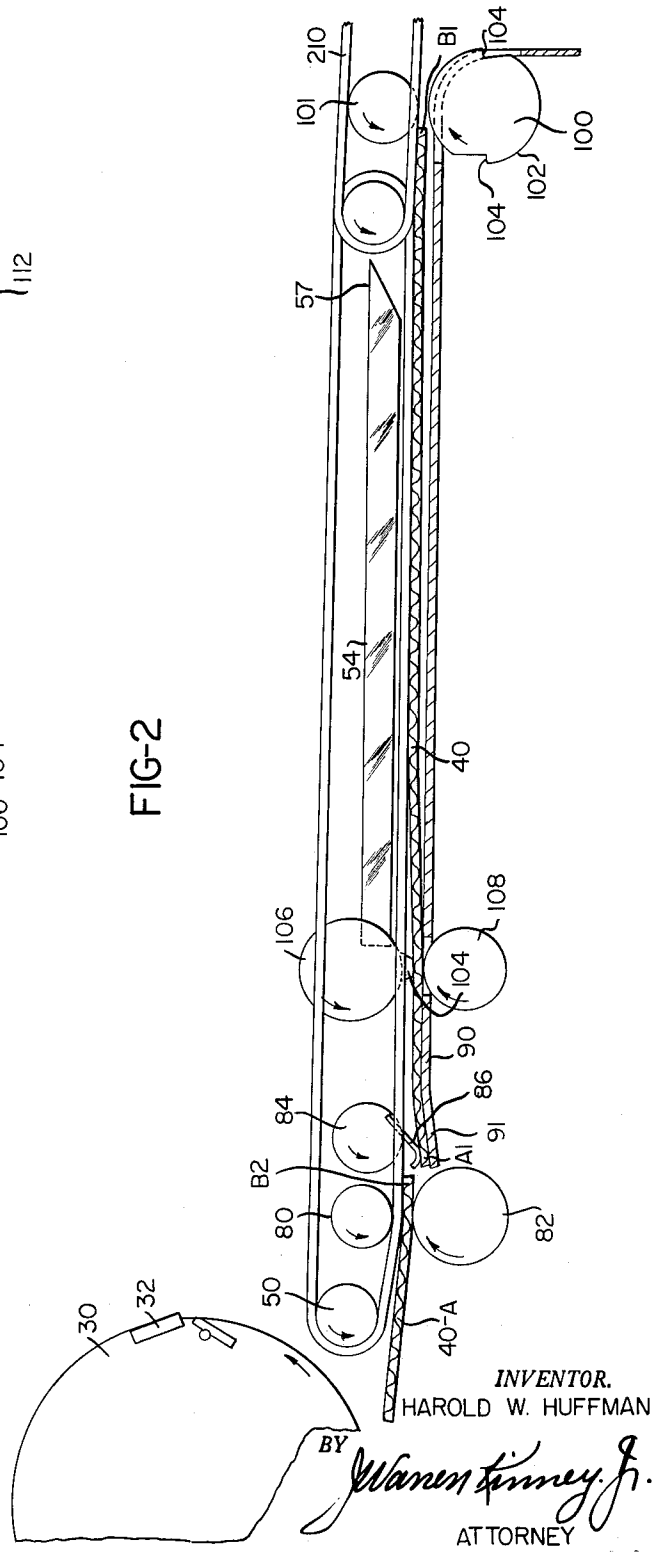

FIG-2

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SHEET DELIVERY MECHANISM

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FIG-3

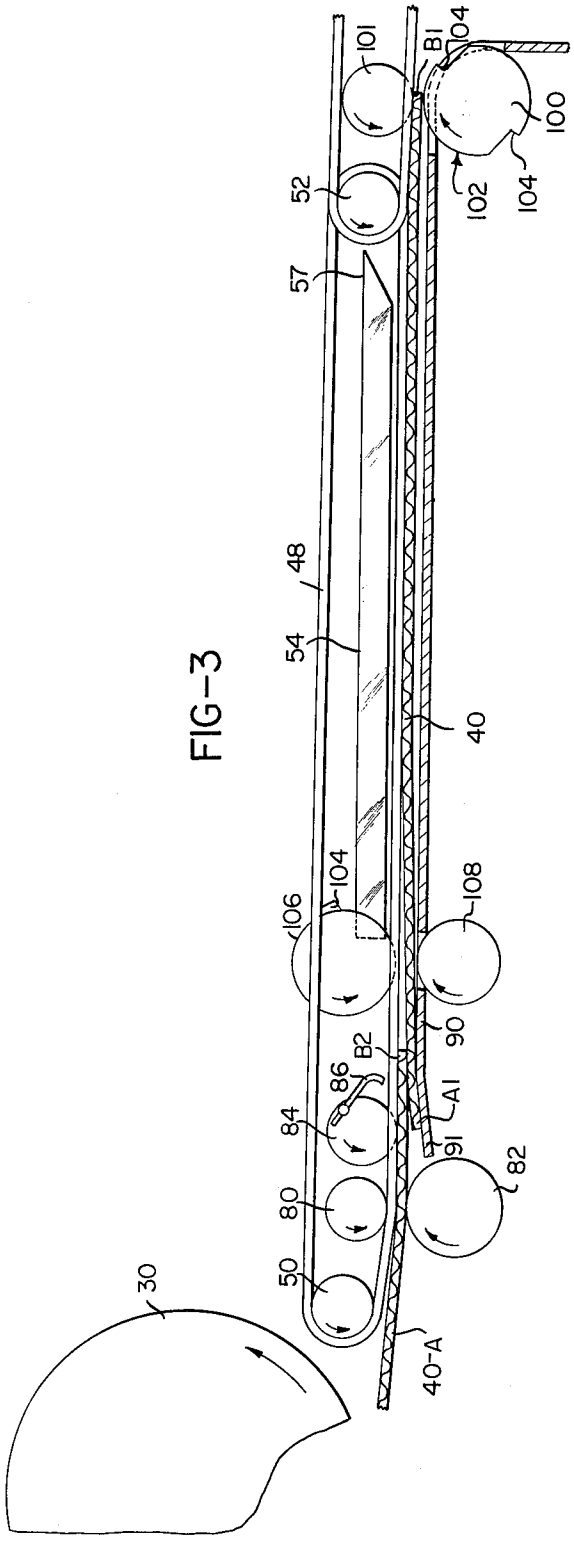
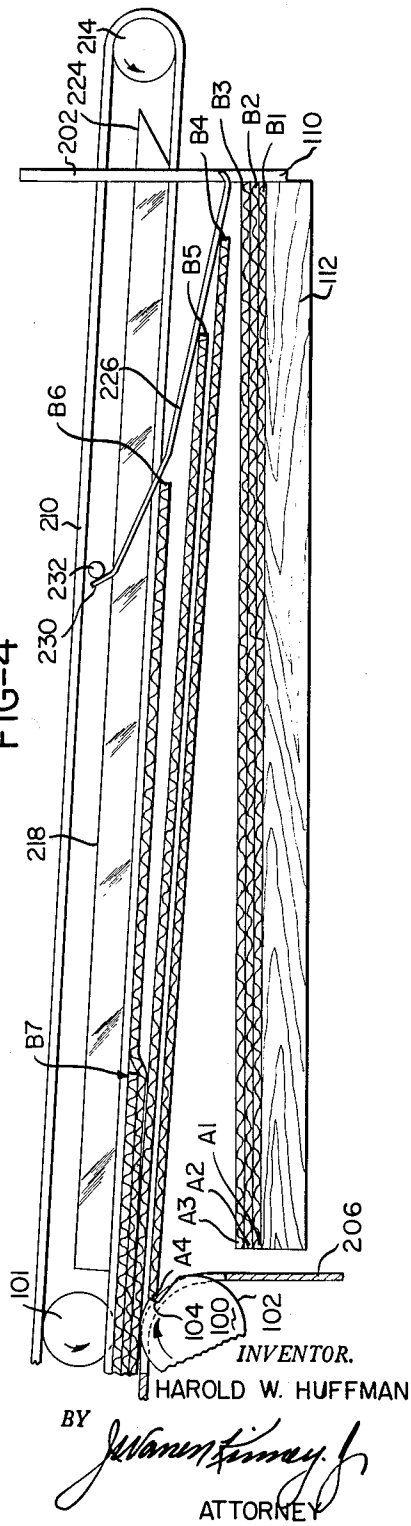


FIG-4



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SHEET DELIVERY MECHANISM

Filed Nov. 30, 1962 6 Sheets-Sheet 3

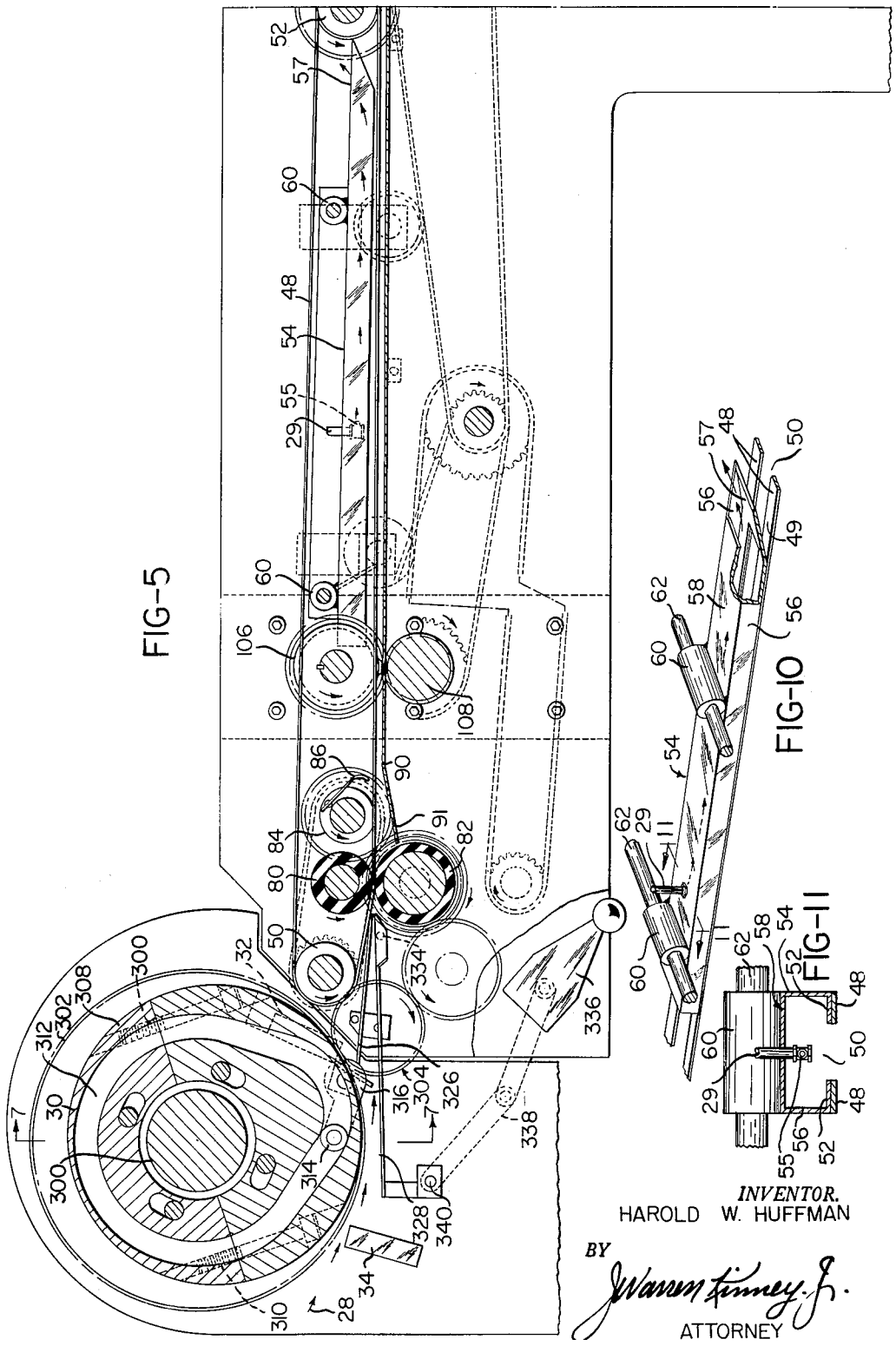

FIG-5

FIG-10

FIG-11

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SHEET DELIVERY MECHANISM

Filed Nov. 30, 1962 6 Sheets-Sheet 4

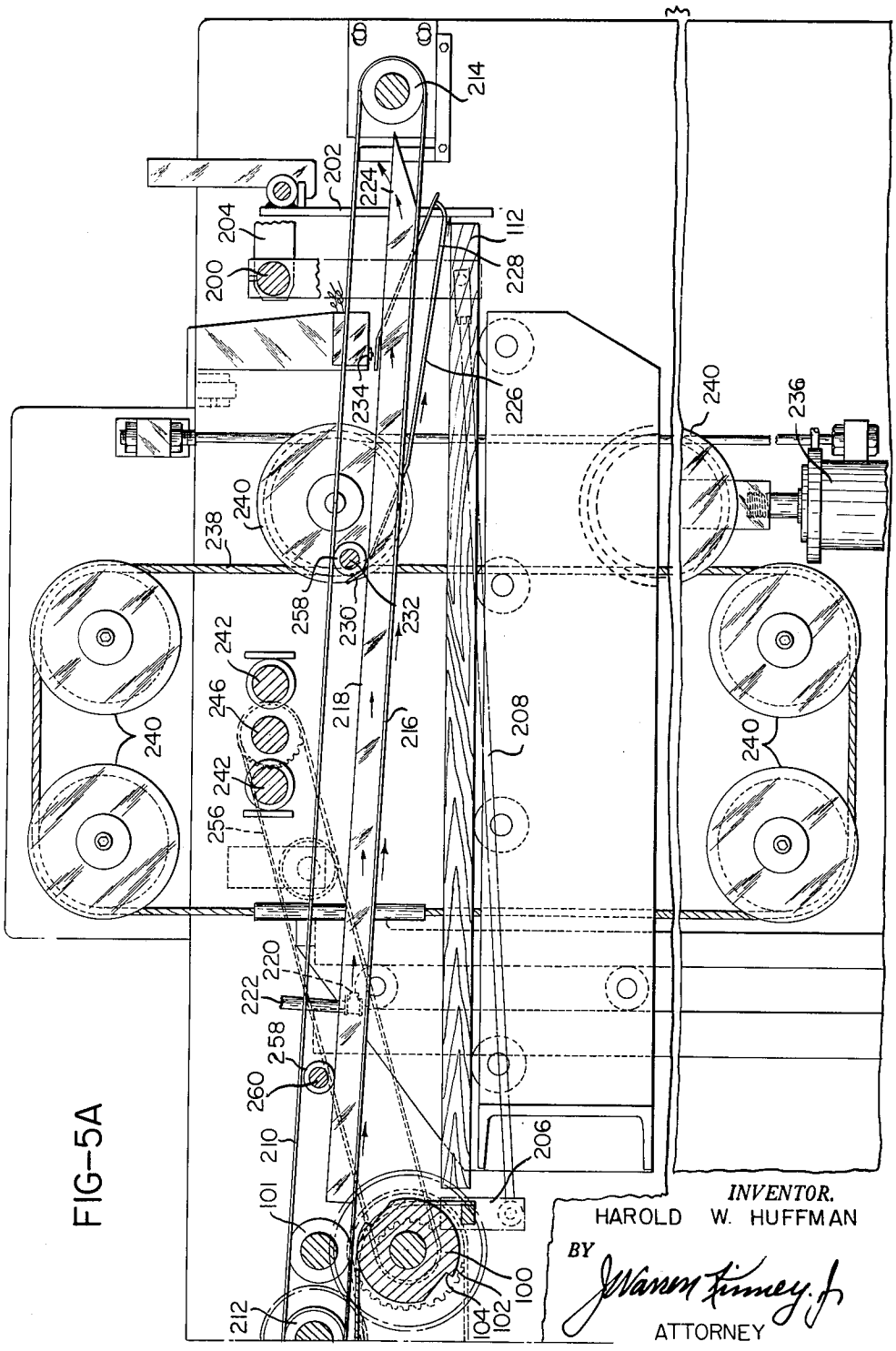

FIG-5A

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SHEET DELIVERY MECHANISM

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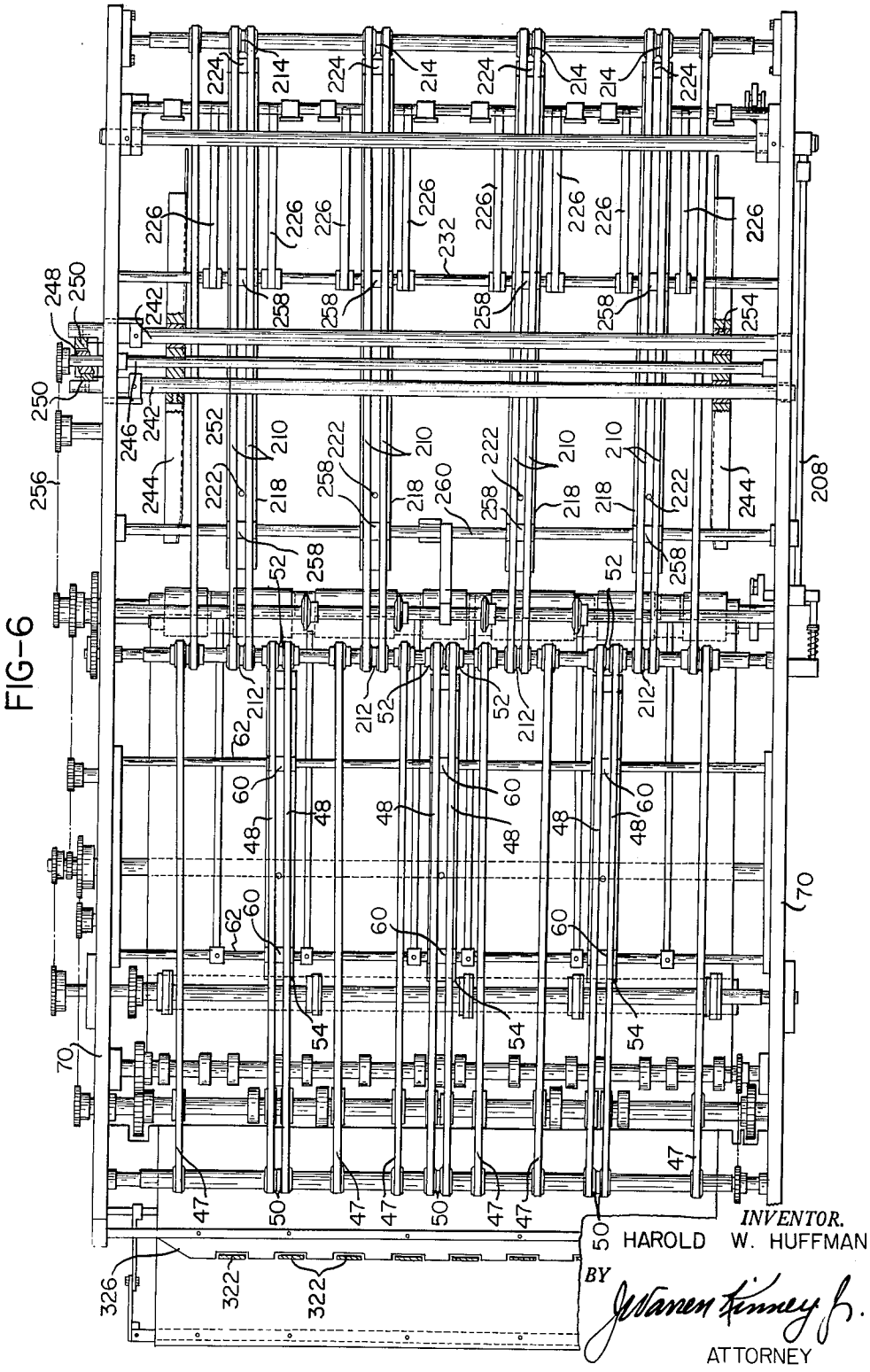
FIG-6



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SHEET DELIVERY MECHANISM

Filed Nov. 30, 1962 6 Sheets-Sheet 6

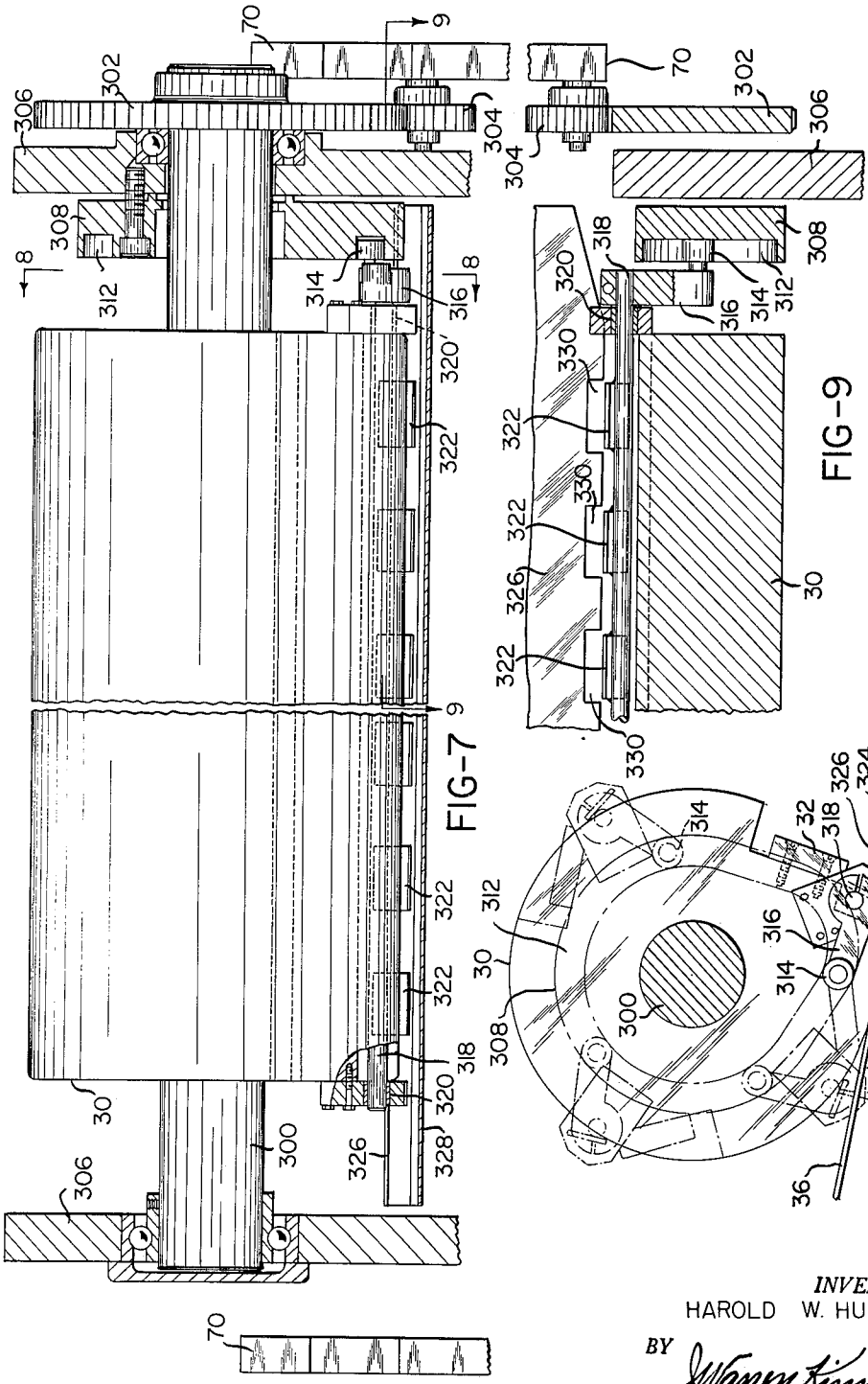

FIG-7

FIG-9

FIG-8

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United States Patent Office 3,228,273 Patented Jan. 11, 1966

3,228,273

SHEET DELIVERY MECHANISM

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Filed Nov. 30, 1962, Ser. No. 241,278
24 Claims. (Cl. 83—94)

This invention relates to a sheet delivery mechanism, and more particularly to a sheet delivery mechanism for use, by way of example, in high speed rotary printing presses wherein it is necessary to stop, in a short space, the forward motion of individual sheets moving at high linear speeds while maintaining said sheets in a flat, non-buckled condition.

An object of the invention is to provide simple yet highly effective means for automatically severing a continuous web moving at a high linear speed into a plurality of sequential individual sheets of uniform length, and of continuously and automatically stacking said individual sheets in echelon relationship with each succeeding sheet overlying the preceding sheet.

Another object of the invention is to provide a device having the hereinabove described characteristics and which includes means for automatically engaging the tail-adjacent portion of each severed sheet while it is being advanced forwardly at a high linear speed for rapidly decelerating said sheet to reduced velocity in such a manner that the inertia of the sheet is utilized for maintaining the sheet in a flat, non-buckled condition during the entire decelerating operation.

A further object of the invention is to provide a device having the hereinabove described characteristics which includes simple, highly effective and unique means for causing individual severed sheets to be disposed in driven, contacting relationship with the under-surface of a plurality of feed belts, wherein the individual sheets are caused to engage the under-surface of the belts by reason of the creation of an air pressure on the upper surface of the sheets less than the pressure on the under-side thereof.

Another object of the invention is to provide a sheeting delivery mechanism which includes means for successively severing individual sheets from a continuous web in association with means for automatically lowering, or "knocking down," the trailing end of each preceding sheet whereby the leading edge of the next succeeding sheet will be disposed above and in overlying relationship with the trailing end of each such preceding sheet.

Still another object of the invention is to provide cam actuated stripper means in conjunction with a rotating knife for automatically and effectively dislodging and lowering the severed trailing edge of a preceding sheet below the leading edge of the succeeding sheet whereby the sequential severed sheets will be disposed in echelon relationship.

Still a further object of the invention is to provide a sheeting delivery mechanism which utilizes a first sheet-conveying belt having a linear speed substantially equal to the linear speed of the continuous web which is severed in individual sheets; and a second sheet-conveying belt which has a linear speed substantially slower than that of the first mentioned sheet-conveying belt assembly for advancing individual sheets forwardly at a relatively low rate of linear motion with the leading edge of each subsequent sheet overlying and adjacent the leading edge portion of a preceding sheet, said device including means for automatically disengaging the lowermost sheet being conveyed from the low speed belt conveyor as said lowermost sheet is advanced to its forward position, at which

location said sheet will be deposited, in flatwise manner, onto the upper surface of a preceding sheet.

These and other objects are attained by the means described herein and as disclosed in the accompanying drawings, in which:

FIG. 1 is a side, diagrammatic view of a sheeting delivery mechanism embodying the teachings of the present invention.

FIGS. 2 and 3 are enlarged views of the left portion of FIG. 1 showing the manner in which the trailing end of a preceding sheet is lowered whereby the leading edge of the next succeeding sheet will be disposed above and in overlapping, echelon relationship with the trailing edge of the preceding sheet.

FIG. 4 is an enlarged view of the right portion of the device of FIG. 1.

FIG. 5 is a side view, with portions thereof in section, for clarity of detail and understanding, illustrating the structural details of that portion of the subject device as diagrammatically illustrated in FIGS. 3 and 4.

FIG. 5–A is a side view, with portions thereof in section for clarity of detail and understanding, illustrating the structural details of that portion of the subject device as diagrammatically illustrated in FIG. 4.

FIG. 6 is a top elevational view of the combined device of FIGS. 5 and 5–A.

FIG. 7 is a sectional view taken on line 7—7 of FIG. 5.

FIG. 8 is a view taken on line 8—8 of FIG. 7.

FIG. 9 is a view taken on line 9—9 of FIG. 7.

FIG. 10 is a perspective view of the air lift means by which individual sheets are disposed in contacting, driven relationship with the under-surface of the sheet-conveying belts of FIGS. 2 and 4.

FIG. 11 is a view on line 11—11 of FIG. 10.

With reference to FIGS. 1, 2, 3 and 5, the numeral 30 denotes generally a rotary cut-off cylinder having one or more knives 32 secured to and carried thereby for cooperation with stationary cut-off blade 34 for sequentially severing, into individual sheets, a continuous web 36 which is advanced at high-speed press-rapidity to the cut-off cylinder 30, the path of web travel being indicated by arrows 28, FIG. 5.

The letter A and its exponents denotes the trailing edge, and the letter B and its exponents denotes the leading edge of each of the sheets severed from continuous web 36.

With particular reference now to FIG. 1, it will be noted that sheet 40 has been severed from web 36, and that the upper surface 41 of sheet 40 is disposed in contacting relationship with the under-surface 44 of the lower reach 46 of each of a plurality of duplicate endless belts 48, arranged in pairs, which pass over rollers 50 and 52, see also FIG. 6. Other such belts 47, similar in nature, may be provided to assist in moving the sheets.

With particular reference now to FIGS. 10 and 11, it will be noted that belts 48 are disposed in laterally spaced parallelism, with a space 50 therebetween. In the preferred embodiment of the invention, the upper surface 49 of the lower reach of said belts is adapted to engage the undersurface of inturned bottom wall flanges 52 of an elongate housing or suction box 54 which includes laterally spaced side walls 56 and a top wall 58. A plurality of these suction boxes, corresponding in number to the number of pairs of belts 48—48 provided, may be suspended from supports 60 secured to and carried by transverse rods 62 which span the side frame members 70 of the machine, as illustrated in FIG. 6.

The purpose of suction boxes 54, is to render the sheets 40 airborne during a portion of their travel beneath belts 48. Air under pressure is introduced as a jet into that end of housing or box 54 remote from discharge end 57 such as, by way of example, through a nozzle 55 suitably

connected to a source of air under pressure delivered by pipe 29. The air thus discharged forwardly within the interior of chamber 54 will pass toward discharge port 57 in upper wall 58, and thereby create a lessened pressure in the space between the laterally spaced edges of bottom walls 52. This lessened pressure between the adjacent laterally spaced edges of bottom wall 52 of chamber 54 will create an area of lessened pressure between the adjacent edges of laterally spaced belts 48 in zone 50, which will automatically cause the upper surface 41 of sheet 40 to be pulled into contacting relationship with the outer face of the lower reach of said belts.

With reference again to FIGS. 1 and 5, the numerals 80 and 82 denote generally a pair of speed-up rolls which are driven at peripheral speeds somewhat in excess of the linear speed at which web 36 is advanced forwardly. The effect of speed-up rolls 80 and 82 is to impart a slight, but pronounced, forward movement to those portions of web 36 disposed between said rolls for insuring a clean severance of web 36 by the cutting action of blades 32 and 34.

The numeral 84 denotes generally a knock-down roll, and the numeral 86 denotes knock-down fingers which are secured to and carried by roll 84. The purpose of knock-down fingers 86 is clearly apparent by comparing FIGS. 1 and 2, it being noted that the action of knock-down finger 86 is timed with reference to the forward linear speed of sheet 40, whereby to engage and literally knock-down or lower the trailing end A–1 of sheet 40 onto supporting element 90 which extends from roll 82 to notched roll 100. The receiving end 91 of element 90 may be slightly inclined downwardly, as shown.

As clearly evident from FIGS. 2 and 3, the leading edge B–2 of the succeeding sheet 40–A will be free to advance forwardly relative to and over the trailing edge A–1 of the preceding sheet 40.

It will be understood, of course, that preceding sheet 40 will be continuously advanced by reason of engagement with belts 48 toward notched roller 100; however, just before leading edge B–1 of sheet 40 is engaged by notched roller 100, the trailing portion of sheet 40 is engaged by a rubber-like lug 104 of a slow-down or sheet tension member 106 which is disposed in cooperating relationship with a rotating element 108 having a slow peripheral speed. In other words, when lug 104 presses sheet 40 into contact with roll 108, the high speed forward motion of sheet 40 will be positively and effectively checked in such a manner that the inertia of sheet 40 is utilized for maintaining said sheet in a flat unwrinkled condition, with the leading edge B–1 directed to and between rollers 100 and 101 as in FIG. 3.

With particular reference now to FIGS. 1, 4 and 5–A, it will be noted that roller 100 has an outer cylindrical periphery 102 and notches 104, which notches are adapted to engage the trailing end of each sheet for positively advancing said sheet forwardly to dispose its leading end B′ in contacting relationship with a vertical stop 110. A support member of sheet gathering means, preferably in the form of a platform 112, is provided intermediate rollers 100 and vertical stop 110 for providing a flat support upon which the severed sheets may be deposited one upon another.

In the preferred embodiment of the invention, platform 112 is mounted for vertical movement and is adapted to be lowered in a progressive or step-by-step manner as the severed sheets accumulate thereon to form a stack. Such progressive lowering of the platform is in accordance with common practice.

With particular reference now to FIG. 5–A, the numeral 200 denotes a transversely mounted shaft which is suitably oscillated for imparting a vibrating motion to jogger plate 202 through lever 204 and to jogger plate 206 through connecting rod 208.

As the sheets are successively advanced as illustrated in FIGS. 1–4, the forward ends B_1, B_2, B_3, B_4, B_5 and B_6 will be contacted by jogger plate 202 and the rear edges A_1, A_2, A_3, A_4, etc. of each of said sheets will be engaged by jogger plate 206, in a manner well known in the art, for thereby accurately and automatically piling the superposed sheets with their respective leading and trailing ends in precise vertical registry.

The sheet piling section of the machine, best illustrated by FIGS. 5–A and 6, may include a series of parallel belts 210 arranged in spaced pairs, and trained over rolls or pulleys 212 and 214 so as to advance the individual sheets 40 onto platform 112 as the sheets leave the belts 48. The sheets are held against the lower reaches 216 of the several belts 210, by the action of suction boxes 218, as was explained previously in the description of FIGS. 10 and 11. Suction boxes 218, like those of FIGS. 10 and 11, are furnished with air jets 220 and air supply pipes 222, performing to establish a negative air pressure therein precisely according to the principle employed in the description of FIGS. 10 and 11. Each suction box 218 is provided with an upwardly discharging port 224 for escaping air.

At 226 is disclosed a stripper, several of which may be arranged in parallelism across the width of the machine, for directing the leading ends of the sheets downwardly over platform 112 and releasing them from the holding power of suction boxes 218 as the sheets approach jogger plate 202. The strippers may be in the form of spring metal straps each having a free end 228 overlying the platform 112 and the sheets compiled thereon, and an opposite anchor end 230 secured to a cross bar 232 on the machine frame.

In a manner known to the art, movements of a stripper resulting from impacts directed thereon by sheets deposited on platform 112, are utilized to actuate an electric micro-switch 234 which controls a hydraulic cylinder 236 arranged to progressively lower the platform as the stack of sheets grows upon the platform. In this arrangement, the platform may be suspended for vertical movement by means of a cable 238 trained over and under a system of pulleys 240. The details of the platform actuating mechanism is of no importance to the present invention, and need not therefore be of serious concern here.

It should here be pointed out that the pairs of belts 210 are to be driven at a linear speed slower than that of belts 48. The speed of belts 210 may approximate one-third the speed of belts 48 in a typical arrangement, although this ratio is not necessarily critical, but desirable. By so arresting the speed of the sheets at the receiving platform, several sheets will at all times assume an echelon suspended relationship to one another (FIG. 4), with the lowermost one of the suspended sheets subject always to positive projection by the notches of roller 100. The arrangement assures well-controlled trouble-free compiling of the sheets upon platform 112 following their release from the suction boxes and transfer belts 210.

B_7 indicates the leading end of a sheet just entering the stacking station, and the illustration of FIG. 4 shows how such sheet is advanced partially over other sheets undergoing stripping from the transfer belts 210, by the action of roll 101.

In FIGS. 5–A and 6, the characters 242 indicate spaced parallel rods mounted upon the machine frame for rapid reciprocation, to actuate jogger plates 244 at the sides of sheet-receiving platform 112. The rods may be reciprocated in any suitable manner, such as by means of a driven rotary shaft 246 carrying a wobble cam 248. Followers 250 on the rods 242 engage the cam and transmit its motion to the rods, which in turn vibrate the side jogger plates 244 through pin connections 252 and 254. A chain drive for shaft 246 is indicated at 256. At 258 are indicated short sleeves fixed upon the upper walls of suction boxes 218, whereby the boxes are suspended from stationary transverse rods 260 and 232.

FIGS. 5 to 9 indicate with some detail the web cut-off mechanism at the head of the machine. Cylinder 30 is

fixed upon a shaft 300 carrying gear 302 which is driven by a gear 304. Shaft 300 is journaled in bearings carried by a head portion 306 of machine frame 70, and to head portion 306 is adjustably fixed a cam 308 constructed preferably in two parts joined together with screws 310, FIG. 5. One face of cam 308 has formed therein a track 312, in which rides a follower or roller 314 mounted upon the free end of a rocker arm 316. The opposite end of rocker arm 316 is fixed to a rock shaft 318 journaled at 320 upon the cylinder, in parallelism with the cylinder axis.

At intervals along rock shaft 318 are fixed a line of web-engaging fingers 322 which function to propel the severed portion of the web after cut-off by knives 34 and 32. The fingers are extended from the cylinder periphery by the action of follower 314 entering a dip in the cam track as indicated by full lines upon FIG. 8, causing the fingers to contact the severed portion of the web and propel it into the throat 324 formed by upper and lower plates 326 and 328, respectively. The plates are fixed with relation to the machine frame, and serve to direct the leading ends of the severed sheets to roller 80 and 82, FIG. 5.

In order that fingers 322 may pass the upper plate 326 as the cylinder rotates, said plate may be notched as indicated at 330, FIG. 9.

For occasional removal of lint or refuse produced by the action of cut-off knives 32 and 34, the lower plate 328 may be hinged as at 334, FIG. 5, and adapted to be lowered about the hinge, for cleaning, by manipulation of a hand lever 336 having linkage connection 338 with the plate at 340. It may be noted that plates 326 and 328 convereg in the direction of rolls 80 and 82, to accurately direct a succession of severed sheets to the bight of the rolls and belt 48.

From the preceding explanation, it will be understood that successive sheets severed from the web by knives 32 and 34 as cylinder 30 rotates, will be projected by fingers 322 to rolls 80 and 82, and to belt 48. Rolls 80 and 82, being speed-up rolls driven at a peripheral speed exceeding the linear speed at which web 36 approaches the cylinder 30, impart a slightly faster advancement of the severed sheets at cut-off, to ensure a clean and definite severance at the cut-off knives.

Upon leaving the speed-up rolls 80–82, a sheet will be struck at its trailing end by knock-down fingers 86 of roll 84, thereby to lower the trailing end of the sheet upon plate elements 90–91, so that it may be there overlapped and over-ridden by the next succeeding sheet fed by rolls 80–82. As will be understood, the sheet so over-ridden will be in motion, advanced by reason of its contact with belts 48 which are high-speed belts. The linear speed of belts 84 should approximate the speed of the web at input, or at cylinder 30.

As the leading end of the sheet advanced by belts 48 approaches notched roll 100, and just before it is engaged thereby, the trailing portion of the same sheet is gripped and momentarily slowed down by the lug 104 of slow-down roll 106 cooperating with a slow-speed roll 108 beneath it. Thus, the high-speed advance of the sheet will be checked at its trailing end, while the leading end is free to advance by its own inertia, which results in a gentle stretching of the sheet to flatten it and preclude wrinkling.

Immediately following release of the sheet by lug 104, its leading end enters between rolls 100 and 101 whence the sheet is directed at reduced speed toward stop plate 110 and onto platform 112 (FIG. 4), the notch 104 delivering the final push against the trailing end A_4 of the sheet.

It is to be noted that sheets in succession assume an echelon or overlapping relationship at two stages of advancement through the machine. The first is at the knock-down roll 84, and the second is at the reduced-speed rolls 100–101. By the time the sheets strike the stop 110 at platform 112, their speed of advancement has been materially reduced, with the result that stacking occurs in an orderly fashion and without risk of disturbance in stacking due to fluttering or failure of the sheets to promptly settle upon the platform.

The high speed belts 48 have a rate of linear travel approximating that of web 36, whereas the low speed belts 210 may be reduced in linear speed to about one-third the speed of belts 48. The linear speed of rolls 80 and 82 is to be slightly greater than the web speed at input, whereas the linear speed of rolls 106 and 108 is to be somewhat less than web speed. The suction boxes at 54 and 218 have no noticeable effect upon the speed of travel of sheets impelled by their respective carrier belts.

The production and handling of sheets in a high speed press according to the teaching of the present invention, assures maximum output of stacked sheets with minimal loss of time, since the improvements herein disclosed practically eliminate the occurrence of sheet jams and shut-downs of the apparatus.

It is to be understood that various modifications and changes in structural details of the apparatus may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. Apparatus for conveying flexible sheet material of a light weight analogous to that of paper, comprising in combination, longitudinally extending laterally spaced substantially horizontal belts, means for driving said belts in unison, means forming an elongate air chamber extending longitudinally of said belts and having an open air outlet end and further having a lower side overlying and spanning the space between said belts, said chamber lower side having a longitudinally extending opening of a width approximating the width of the space between said belts, means for delivering a sheet of flexible material to a substantially horizontal position in spanning relation with said spaced belts on the sides of the belts opposite from the said lower side of said chamber, and means for introducing air under pressure into said chamber above said longitudinally extending opening and toward said air outlet end for creating a flow of air longitudinally through said chamber toward and for discharge through the said open outlet end to thereby produce a reduced air pressure above the said sheet of material to elevate the sheet into contacting engagement with said moving belt and support the said sheet on an air cushion against said belts and for movement by said belts in the direction of air flow through the chamber.

2. A flexible sheet material handling apparatus, comprising a plurality of longitudinally extending laterally spaced belts having substantially horizontal upper and lower surfaces, means associated with said belts for driving the same in unison, means for positioning a sheet of flexible material in spaced relation with the lower surfaces of said belts, and means including a suction box positioned with respect to the said upper surfaces of said belts for reducing atmospheric pressure above said flexible sheet of material whereby to effect elevation of said sheet into contacting engagement with the said lower surfaces of said belts to effect movement of said sheet by said belts.

3. The apparatus as set forth in claim 1, wherein the combination includes means for stripping the sheet from the moving belts.

4. In a high-speed sheet delivery mechanism, the combination of means for severing a moving web to produce individual sheets each having a leading end and a trailing end, a platform to receive the sheets in stacked condition, and means for conveying the sheets to the receiving platform, comprising a plurality of spaced parallel endless belts having upper reaches and lower reaches, means driving said belts to move the lower reaches in the direction of the receiving platform, means including an elongate suction box disposed over the lower reaches of the belts

and having a longitudinal bottom wall slot in vertical alignment with the space between the belts, and means for delivering a forced air flow longitudinally of the box in the direction of movement of said reaches acting to elevate and maintain the sheets in suspension against the lower reaches of the belts as the sheets are conveyed thereby toward the receiving platform.

5. The device as set forth in claim 4, wherein the combination includes means for disposing the trailing end of a sheet beneath and overlapped by the leading end of a succeeding sheet, in advance of sheet suspension by the force of suction induced by the suction box.

6. In a high-speed sheet delivery mechanism, the combination of means for severing a moving web to produce individual sheets each having a leading end and a trailing end, a sheet gathering means, and means for conveying the sheets to said gathering means, comprising a plurality of spaced parallel endless belts having upper reaches and lower reaches, means driving said belts to move the lower reaches in the direction of said sheet gathering means, means including an elongate open-bottomed suction box disposed over the lower reaches of the belts acting to urge the sheets into contact against the under surfaces of the lower reaches of the belts as the sheets are conveyed thereby toward the gathering means, and means operative momentarily upon the trailing end only of each of the sheets in succession, to check the forward movement of the sheet toward the gathering means and effect a stretching of the sheet lengthwise and maintenance of the sheet in a flat unwrinkled condition while it is held in suspension by the action of the suction box.

7. The device as set forth in claim 6, wherein the means last mentioned comprises a gripper embodying a rotary element over which the sheet moves and a lug member rotating in a vertical plane above the sheet and rotating element to spot press the sheet against the underlying rotating element to effect the said check of the forward movement of the sheet.

8. In a high-speed sheet delivery mechanism, the combination of means for severing a moving web to produce individual sheets each having a leading end and a trailing end, a sheet gathering means, and means for conveying the sheets to said gathering means, comprising a plurality of spaced parallel endless belts having upper reaches and lower reaches, means driving said belts to move the lower reaches thereof in the direction of said sheet gathering means, said lower reaches having upper and lower surfaces, means including an elongate open-bottom suction box disposed in overlying relation with the upper surfaces of the lower reaches of the belts acting to elevate and urge the sheets into contact with and against the lower surfaces of said lower reaches of the belts for movement thereby toward the gathering means, a gripper operative upon the trailing end only of each sheet to momentarily arrest advancement of the sheet beneath the suction box and effect flattening the sheet by the force of inertia acting at the leading end of the momentarily arrested sheet, and means located in advance of the gripper, for engaging and disposing the trailing end of a sheet beneath and overlapped by the leading end of a succeeding sheet.

9. The device as set forth in claim 8, wherein the combination includes means for materially decreasing the speed of sheet advancement, and compiling successive sheets in echelon arrangement, incident to delivery of the sheets to the gathering means aforesaid.

10. In a high-speed sheet delivery mechanism, the combination of a rotatably supported cylinder having a lower or under side, means for directing a high-speed moving web tangentially across and in close proximity to the lower side surfaces thereof, and means for rotating the cylinder at a speed approximating the speed of web advancement, means including a cutter carried by the cylinder for severing the web to produce individual sheets, and means in advance of and substantially aligned with the said lower side of the cylinder operative to engage and speed up advancement of a sheet immediately subsequent to completion of the severing action producing the sheet, for effecting clean severance of the sheet from the web.

11. The combination as set forth in claim 10, wherein the means last mentioned includes a pair of spaced speed-up rolls between which the advancing edge of the sheet is gripped.

12. In a high-speed sheet delivery mechanism, the combination of a rotatably supported cylinder having a lower or under side, means for directing a high-speed moving web tangentially across and in close proximity to the lower side surface thereof, and means for rotating the cylinder at a speed approximating the speed of web advancement, means including a cutter carried by the cylinder for severing the web to produce individual sheets, a pair of speed-up rolls between which the sheet is gripped and induced to advance after severance at a speed greater than the speed of web movement, means operative upon a severed sheet at and after its trailing end has moved past said speed-up rolls, to lower said end while the sheet resumes approximate web speed, in order to provide for overlap of the next succeeding sheet upon the trailing end of the sheet so lowered, and means for advancing the overlapped sheets in unison toward a delivery station.

13. In a high-speed sheet delivery mechanism, the combination of means for severing a moving web to produce individual sheets each having a leading end and a trailing end, said severing means including a rotary cylinder and a cutter carried thereby to sever the web, means rotating the cylinder at a speed approximating the speed of web advancement, and a pair of speed-up rolls to grip a sheet after severance from the web and advance it along a substantially horizontal path, at a speed greater than that of the web speed at the cylinder, means operative upon a severed sheet at its trailing end only to lower said trailing end, to provide for overlap of the next succeeding sheet upon the trailing end of the sheet so lowered, and means for further advancing the overlapped sheets at approximate web speed, said last mentioned means comprising a group of spaced parallel endless belts having upper and lower reaches, the lower reaches having upper and lower surfaces, means driving said belts to move the lower reaches thereof in a direction away from the cylinder, means including an elongate open-bottom suction box disposed over the upper surfaces of said lower reaches of the belts acting to elevate and maintain the sheets in contact with and against the undersurfaces of the said lower reaches of the belts as the sheets are conveyed thereby, a gripper operative upon each sheet at its trailing end only, to momentarily arrest advancement of the sheet beneath the suction box for effecting flattening the sheet by the force of inertia acting at the leading end of the momentarily arrested sheet, a second group of spaced parallel endless belts having upper and lower reaches substantially coplanar with those of the first belt group, and means for driving the belts of the second group at a speed materially slower than the speed of the first group, whereby the sheets fed from the first to the second group of belts are forced to overlap one another as discharged by the belts of the second group.

14. The device as set forth in claim 13, wherein the combination includes a sheet gathering platform beneath the belts of the second group, a second elongate open-bottom suction box disposed over the lower reaches of the belts of the second group, acting to suspend and urge the overlapped sheets into contact against the undersides of the lower reaches of the belts of the second group as the sheets are conveyed thereby, and means for stripping the overlapped sheets from the second suction box for delivery to the sheet gathering means aforesaid.

15. In a high-speed sheet delivery mechanism, the combination of a plurality of spaced parallel endless belts having upper and lower reaches, and means driving said belts so that the lower reaches thereof move in unison and in a common direction, said lower reaches having under sides, an elongate open-bottom suction box disposed over and extending longitudinally of the lower reaches of the belts, acting to suspend and urge against said under sides of said lower reaches a group of sheets fed beneath said lower reaches, means for feeding to the under sides of the lower reaches of the belts a succession of overlapped flexible sheets having leading and trailing ends, with the trailing end of one sheet arranged in echelon with the trailing end of a superposed sheet, means for delivering an impact blow against the trailing end of the lowermost one of the overlapped sheets in succession, to project said lowermost sheet relative to the sheet superposed thereon, and a receiving platform to accumulate the sheets so projected in succession.

16. The device as set forth in claim 15, wherein the combination includes means for successively stripping the leading ends of the overlapped sheets from the suction box and the belt reaches carrying the sheets.

17. A suction device for a high-speed sheet delivery apparatus, comprising an elongate box having upstanding spaced side walls, a top wall spanning the side walls, and opposite ends, longitudinal inwardly turned flanges on the side walls disposed in a plane parallel to the plane of the top wall, with the flanges spaced apart in substantial parallelism forming an air admission slot, the ends of the box being open for passage of an air current longitudinally through the box, an upwardly inclined wall at one open end of the box for deflecting moving air upwardly away from the inturned flanges, an air nozzle for directing a jet of air lengthwise within the box in the direction of the end carrying the deflecting wall, and means for supplying air under pressure to said nozzle.

18. In combination, a pair of spaced parallel conveyor belts movable in unison and in a common plane, an elongate box having upstanding spaced side walls, a top wall spanning the side walls, and opposite ends, a longitudinal inwardly turned flange on each side wall, said flanges providing tracks against which the belts travel exteriorly of the box, the flanges being spaced apart in substantial conformity with the spacing between the belts, and in a plane parallel to the common plane of the belts and providing an air admission slot, the ends of the box being open for passage of an air current longitudinally through the box, an upwardly inclined wall at one open end of the box for deflecting moving air upwardly away from the belts, and an air nozzle near one end of the box for directing a jet stream of air lengthwise within the box toward the deflecting wall aforesaid and in the direction of travel of the belts against said tracks, to create a negative pressure within the box and between the spaced conveyor belts.

19. In high-speed sheet delivery mechanism, means for severing a moving web to produce individual sheets each having a leading end and a trailing end, a sheet gathering means, and means for conveying the sheets severed successively from said web to said gathering means, comprising a plurality of spaced parallel endless belts having upper reaches and lower reaches, means driving said belts to move the lower reaches in the direction of said sheet gathering means, means including an elongate open-bottomed suction box disposed over the lower reaches of the belts with the bottom opening in vertical line with the spaces between the belts, means for directing a forced flow of air in and longitudinally of the box in the direction of movement of said lower reaches of the belts and discharging the air outwardly and upwardly from the end of the box directed toward said gathering means, acting to elevate the sheets into contact with the under surfaces of the said lower reaches of the belts as the sheets are conveyed thereby toward said gathering means, and means operating to apply momentary pressure upon the top of the trailing end of each of the sheets in succession to effect a gentle stretching of the sheets lengthwise to avoid tendency of the sheets to buckle while elevated by the action of the suction box.

20. In high-speed sheet delivery mechanism, a rotatably supported cylinder, means for directing a high-speed moving web tangentially across and in close proximity to the surface thereof, means for rotating the cylinder at a speed approximating the speed of web advancement, means including a cutter carried by the cylinder for severing the web to produce individual sheets, means operative to engage the rear edge of a severed sheet and propel the sheet forwardly immediately following the severing action producing the sheet, for effecting clean separation of the sheet from the web, and means receiving the leading edge of such sheet for speeding up the advancement of the sheet.

21. The invention as defined by claim 20, wherein the penultimate means comprises rockably supported cylinder actuated fingers advanced by the cylinder in the direction of movement of the severed sheet.

22. High-speed sheet delivery mechanism, comprising a substantially horizontal rotatably mounted cylinder having a forward side and a lower side, means for rotating the cylinder, cooperating sheet cutter blades one of which is positioned adjacent to the lower side of said cylinder and the other blade being carried by and turning with the cylinder, a pair of vertically spaced guide plates lying adjacent to the lower side of the cylinder forwardly of the said one of the cutter blades and extending forwardly in convergent relation and forming a rearwardly opening forwardly tapering receiver having an open forward end for a sheet severed by said cutters from a web advanced toward the receiver between the cylinder and said one cutter, spaced parallel endless belts extending forwardly from the cylinder and passing at the rearward ends thereof around rollers positioned above and adjacent to the uppermost plate of said receiver, the tapering forward end of the receiver lying forwardly of said rollers and in close proximity to the underside of the lower reaches of the belts, a pair of superimposed driven speed-up rollers lying one above and the other below and transversely of the lower reaches of the belts, said tapering open forward end of said receiver being directed into said speed-up nip of the rollers, and means overlying the said lower reaches of said belts and extending lengthwise thereof from a position forwardly of said pair of speed-up rollers for elevating sheets by reduction of air pressure above the sheets, into engagement with the undersides of said lower reaches of the belts whereby the sheets are moved airborne by the engaged belts.

23. The invention according to claim 22 with means for effecting overlapping of the rearward end of one sheet by the advancing end of a succeeding sheet sped-up by said speed-up rolls, which comprises a knock-down rotating finger moving in a circular path closely adjacent to the forward side of the speed-up rolls to engage the top of said rearward end of said one sheet and depress it below the plane of said advancing end of said succeeding sheet.

24. The invention according to claim 23, wherein said lower reaches of said endless belts move the sheets forward from the speed-up rolls at a slower speed than do the speed-up rolls to facilitate said overlapping, and coacting rollers positioned forwardly of said knock-down finger and between which coacting rollers the lower reaches of the belts and the sheets move and one of said coacting rollers having a resilient lug for lightly pinching a sheet adjacent to the rear end thereof against the underlying roller to momentarily slow-down advancement of the sheet.

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