March 4, 1941. W. F. GRUPE 2,234,116

APPARATUS FOR STACKING SHEETS

Filed March 12, 1938 6 Sheets-Sheet 1

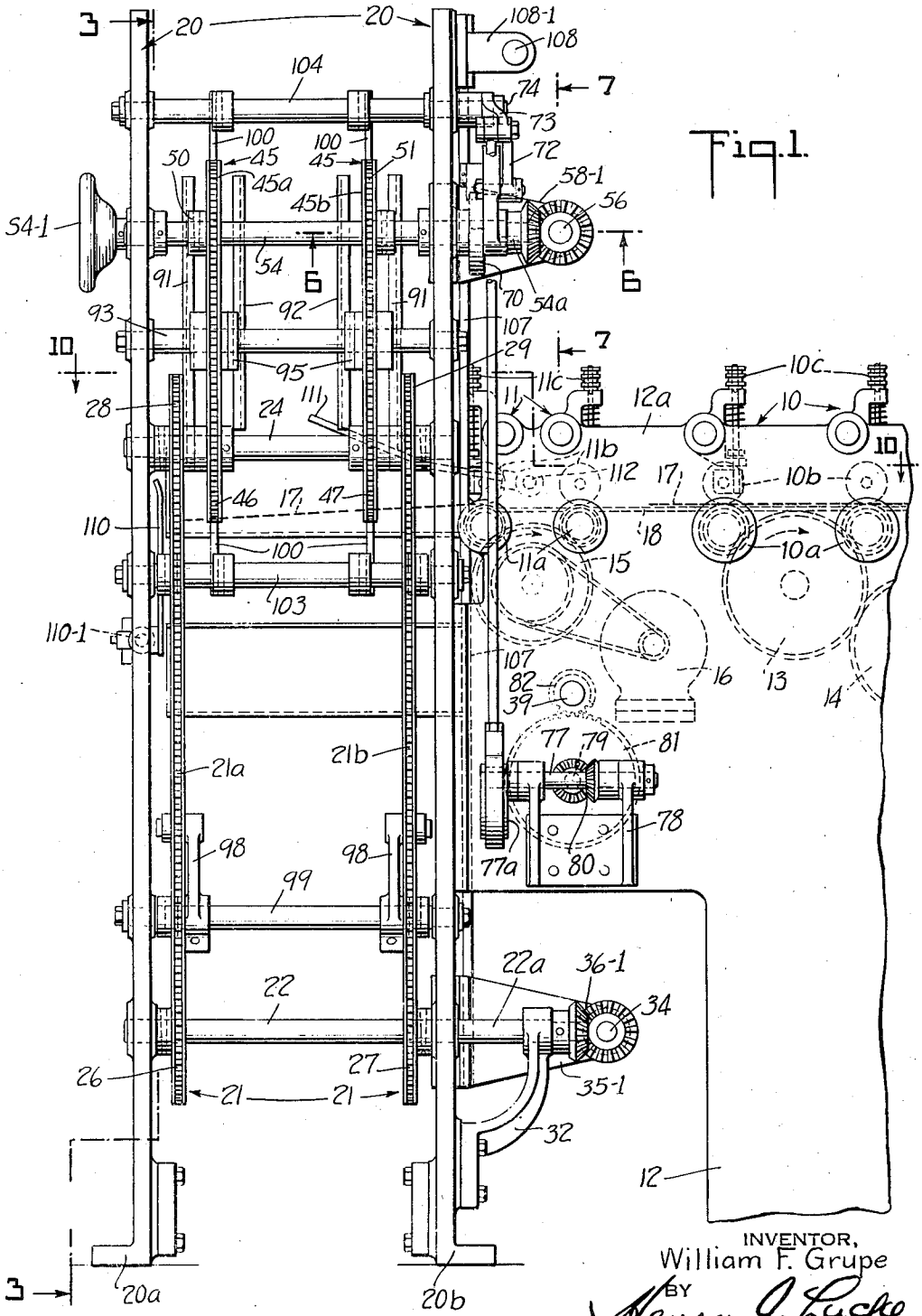


Fig. 1.

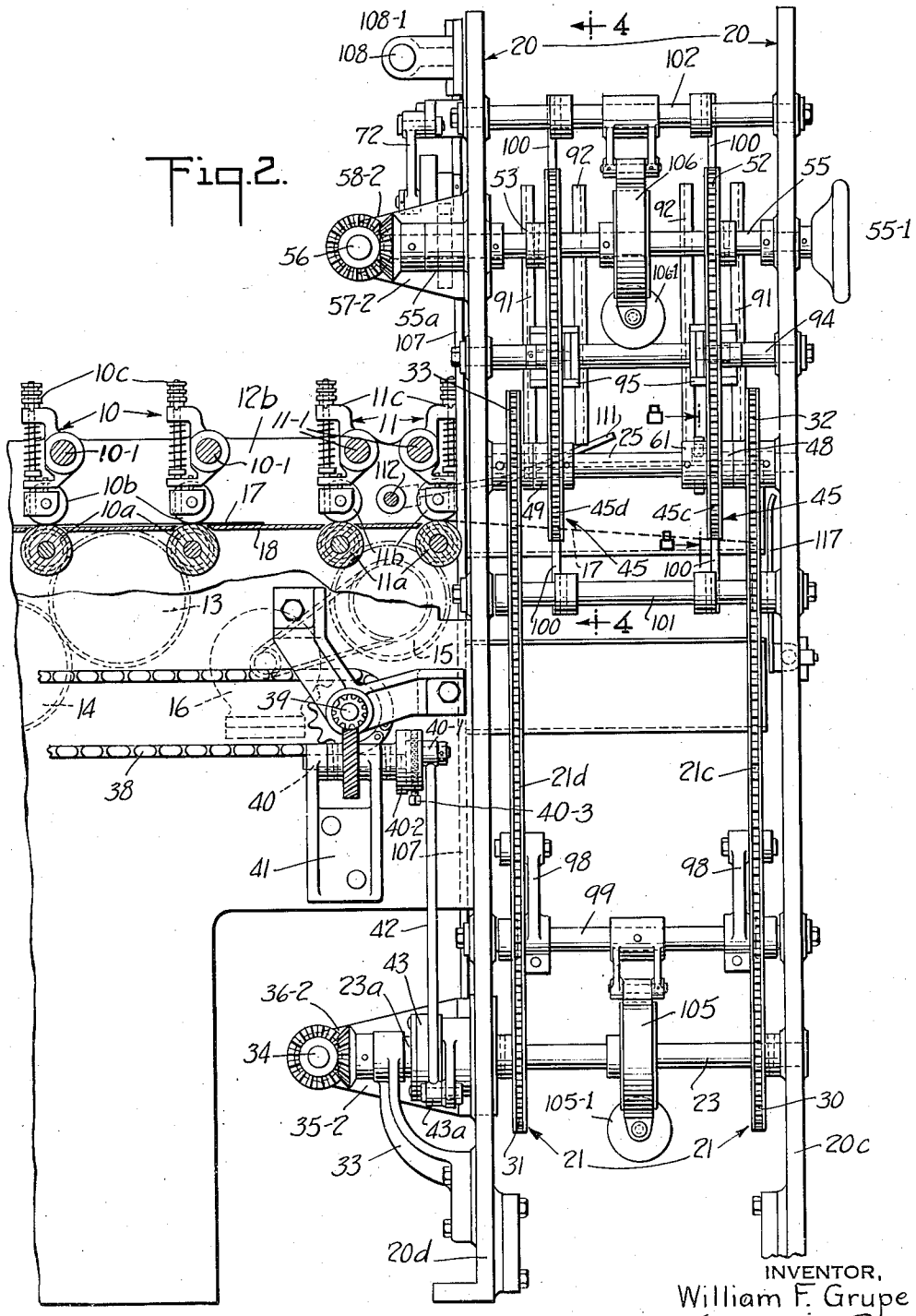
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APPARATUS FOR STACKING SHEETS

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Fig. 2.



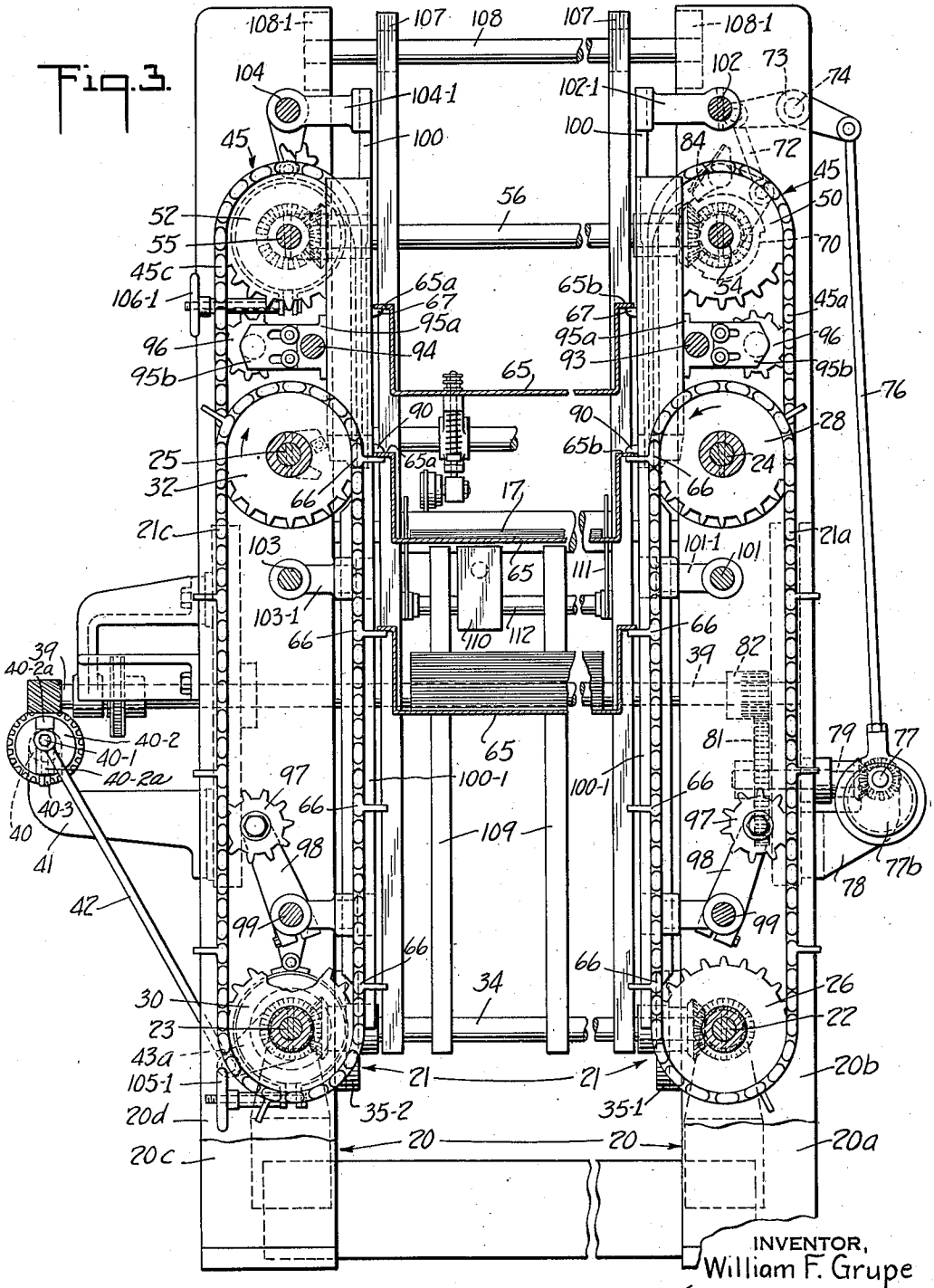
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APPARATUS FOR STACKING SHEETS

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Fig. 3.



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APPARATUS FOR STACKING SHEETS

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Fig. 4.

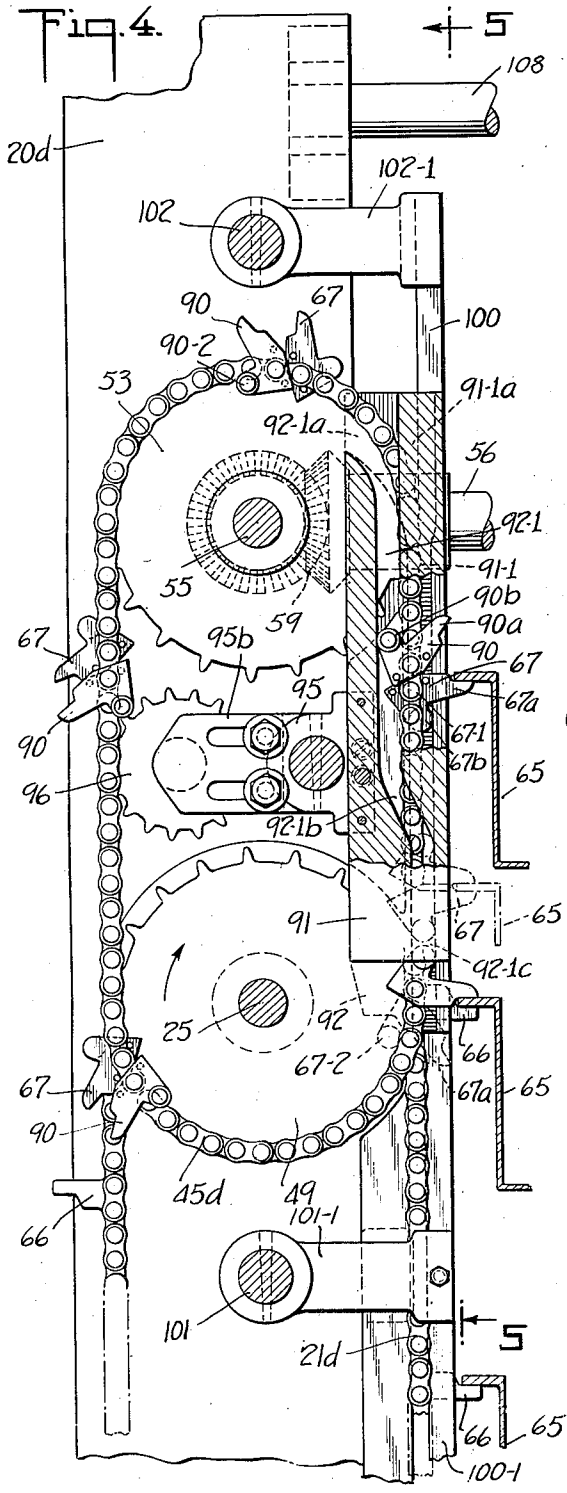
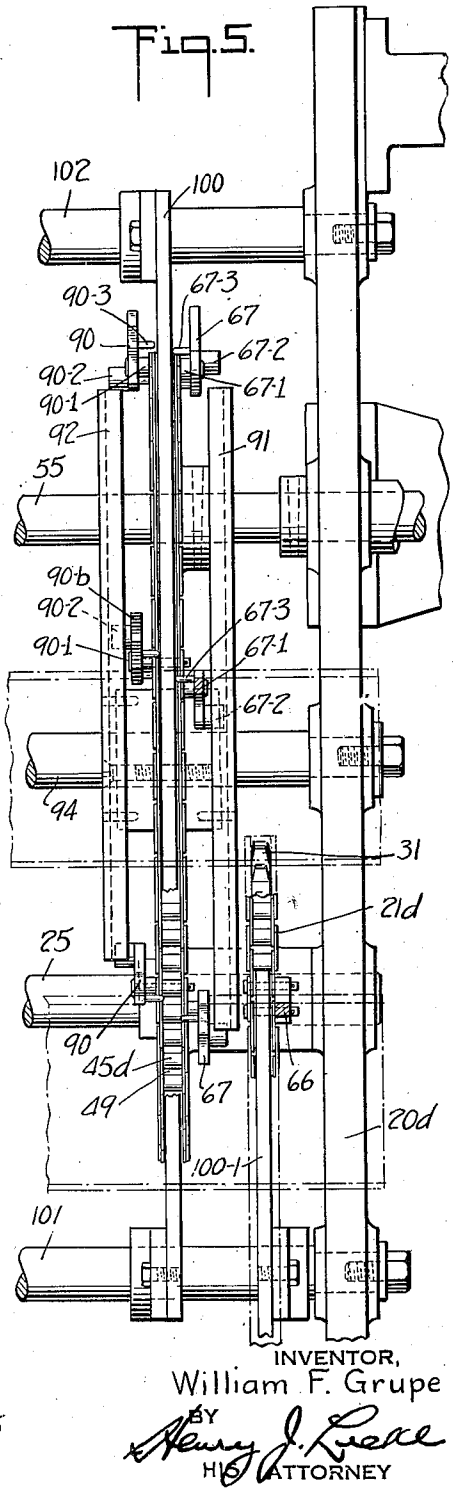


Fig. 5.



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APPARATUS FOR STACKING SHEETS

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Fig. 6.

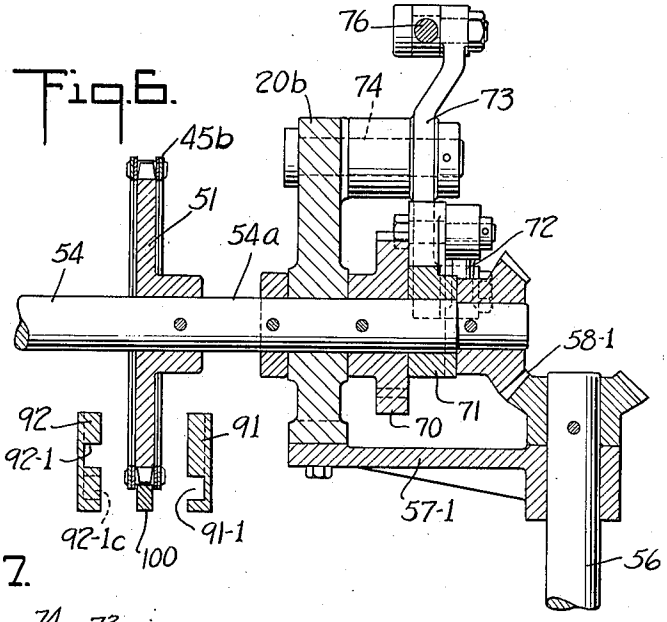


Fig. 7.

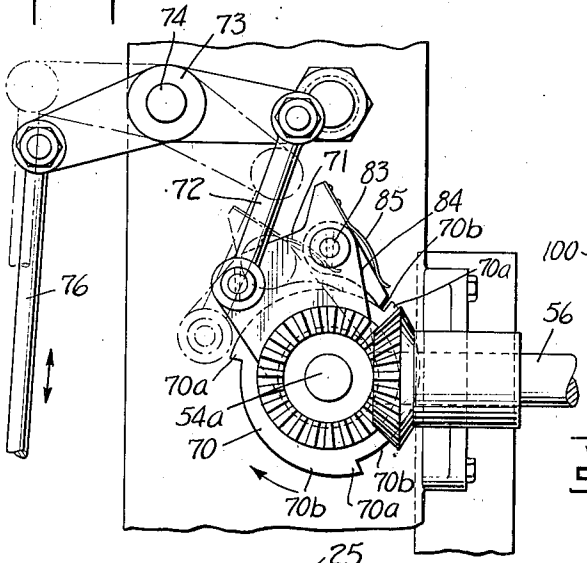


Fig. 8.

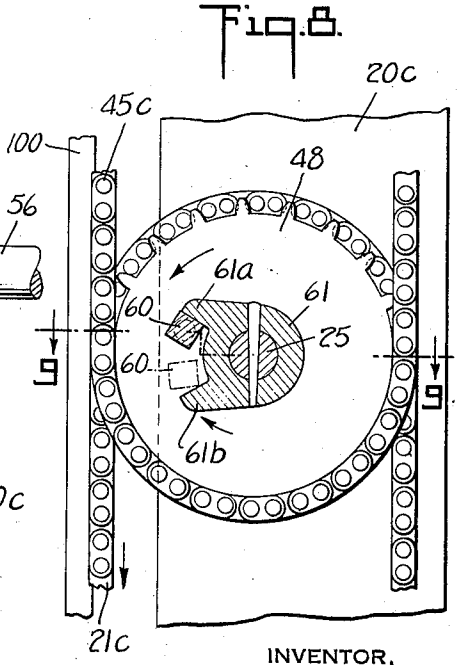
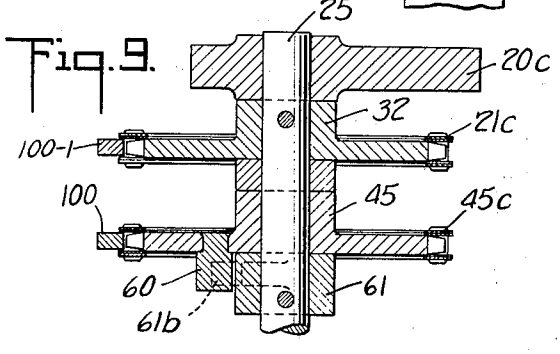


Fig. 9.



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APPARATUS FOR STACKING SHEETS

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Fig. 10.

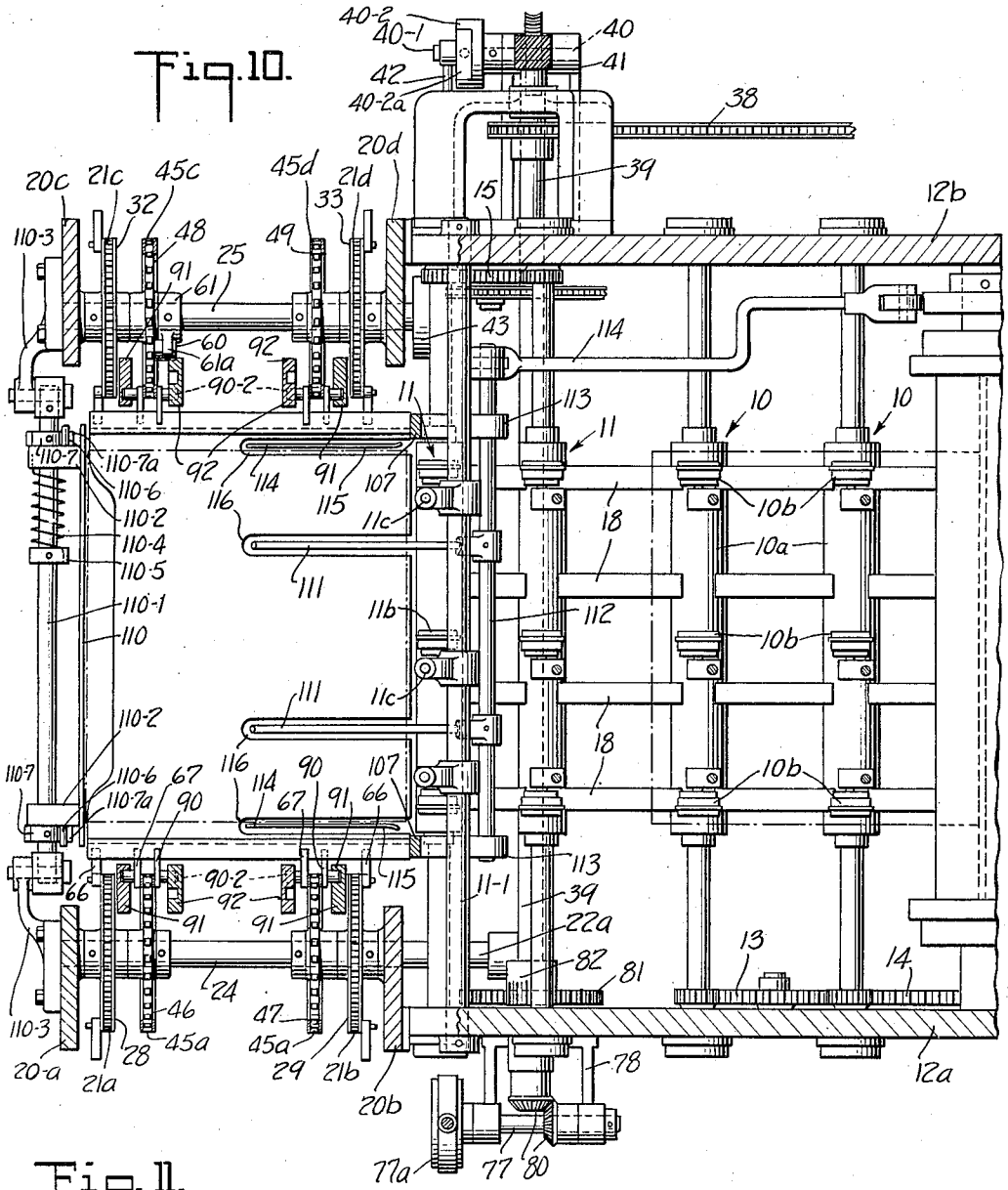
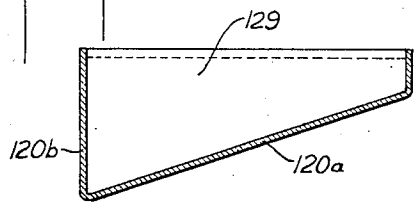


Fig. 11.



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Patented Mar. 4, 1941 2,234,116

UNITED STATES PATENT OFFICE

2,234,116

APPARATUS FOR STACKING SHEETS

William F. Grupe, Lyndhurst, N. J., assignor to Champlain Corporation, a corporation of New York

Application March 12, 1938, Serial No. 195,463

17 Claims. (Cl. 271—76)

This invention relates to apparatus for stacking individual sheets produced from a web as the web travels. In particular, the invention contemplates the provision of an apparatus for automatically regulating the delivery of individual sheets as they are produced successively from a traveling web of material so that further operations may be pursued in the stacking of the sheets to form segregated stacks.

It has been found that proper stacking of individual sheets of material as they are delivered successively, one immediately following the other subsequent to production from the original web, requires a certain time interval to elapse between delivery of each sheet and the one next following to facilitate proper superimposition of a delivered sheet on the stack being formed. A time interval adequate for accomplishing proper placement of the individual sheets on the stack may be most conveniently attained, without interference with production, by separating the sheets along the direction of sheet travel by distances proportionate to the time interval required. This may be accomplished in various ways, but preferably by advancing each individual sheet in the direction of travel at a speed greater than the speed of the sheet that immediately follows.

In accomplishing stacking following the aforesaid regulated delivery, the sheets are superimposed one upon another while the formed portion of the stack is progressively withdrawn at a rate slightly greater than the rate of formation of the stack. At intervals, corresponding to the desired height of the individual stacks, the stack or stacks formed are segregated from the stack or stacks to be formed within and at the time interval between the delivery of two mutually adjacent sheets.

The segregation is most effectively accomplished by rapidly inserting separating means between the last formed stack and the stack next to be formed. For this purpose, separating means may be placed ready for rapid advancement into functional position at the appropriate moment. The separating means is preferably advanced toward sheet-receiving position at the same rate that the bottom of the stack being formed recedes from sheet-receiving position, and, at the appropriate moment, is rapidly advanced directly into sheet-receiving position.

By withdrawing the bottom of the stack being formed at a rate faster than the rate of stack formation, a clearance is provided between individual stacks. The rate of withdrawal is desirably sufficiently fast to provide a clearance of magnitude capable of accommodating the interposed separating means as well as affording free space for facilitating ultimate disposition of the successively segregated stacks.

In the instance of delivery of individual sheets to the stacking mechanism substantially horizontally, and especially when the material of the sheets is freely flexible and subject to buckling when unsupported, the speed of delivery of the sheets must be great enough to avoid, by the principle of inertia, undue buckling as they pass into the staking mechanism. The necessary minimum speed will of course vary according to the degree of flexibility of the sheet material concerned and according to the lengths of the individual sheets, the speed necessarily increasing as the degrees of flexibility and the lengths increase.

Thus, it is apparent that among the primary objects of this invention are first to regulate delivery of individual sheets successively produced from a traveling web, and second to receive the delivered sheets in such manner as to build successively segregated individual stacks of superimposed sheets.

Preferred apparatus employed in the carrying out of the invention is entirely automatic in operation. Advantageously, it is for the most part operated directly from the machine employed in producing the individual sheets from the traveling web.

Characteristic of the particular apparatus here disclosed is its relative simplicity of structure, its positivity of operation, its adjustability to a variety of individual requirements, and its ease of maintenance in correct operative order.

Briefly, roller means receive the sheets as they are discharged from the producing machine and feed them, at web speed, to roller means operative at a speed greater than the operative speed of the receiving roller means, for subsequent delivery to stacking mechanism. The relative grips of the stated roller means are so regulated that a sheet, passing from one to the other, may be whisked along its path of travel at increased speed without retardation or injury by reason of the differential speed of the roller means.

In the instances of substantially horizontal delivery to the stacking mechanism of freely flexible sheets, that roller means which effects ultimate delivery of the sheets to the stacking mechanism must motivate the sheet at a speed sufficiently great to prevent, by the principle of inertia, undue buckling of the sheets as they are delivered. Accordingly, to anticipate such instances, means may be provided for motivating the stated roller means at the required speed irrespective of the operative speed of the producing machine. Thus, the usual lag, under the normal, of operative speed of the producing machine at the stages of starting and stopping of the producing machine, has no adverse affect

on the speed of ultimate delivery of the individual sheets to the stacking mechanism.

The stacking mechanism advantageously includes conveyor means adapted to hold receptacles and to progressively advance and withdraw the receptacles toward and from sheet-receiving position. The advance of an empty receptacle into sheet-receiving position may be accomplished within the time interval elapsing between discharge of two mutually adjacent sheets, by an auxiliary conveyor desirably operating, at the appropriate moment, at a speed substantially synchronized with the speed of operation of the sheet-producing machine. The individual receptacles per se provide the means for segregating successively formed individual stacks of sheets.

Further objects and features of the invention will be apparent from the following detailed description in conjunction with the accompanying drawings, in which:

Fig. 1 represents a right-side elevation (when considered from a position facing the discharge end of the sheet-producing machine) of a preferred embodiment of delivery and stacking apparatus pursuant to the invention.

Fig. 2 represents a left-side elevation (considered from the same position) of the embodiment of Fig. 1, a portion of the delivery mechanism being illustrated in vertical section.

Fig. 3 represents a vertical section taken on the line 3—3, Fig. 1.

Fig. 4 represents an enlarged vertical section taken on the line 4—4, Fig. 2.

Fig. 5 represents an elevation taken on the line 5—5, Fig. 4.

Fig. 6 represents a section taken on the line 6—6, Fig. 1.

Fig. 7 represents an elevation taken from the line 7—7, Fig. 1.

Fig. 8 represents a view partly in section taken on the line 8—8, Fig. 2.

Fig. 9 represents a section taken on the line 9—9, Fig. 8, and

Fig. 10 represents a horizontal section taken on the delivery and stacking mechanism line 10—10, Fig. 1, and

Fig. 11 is a detail view of another embodiment of receptacle advantageously employed with the apparatus of the preceding figures. The receptacle is illustrated in vertical section taken on a line parallel with the lateral sides thereof.

Referring to the drawings, the apparatus illustrated is preferred for carrying the present invention into practice. By its use, the various operations may be accomplished automatically in correlation with the operation of the machine employed for producing individual sheets successively from a traveling web of material.

Pursuant to the first stage of operation, delivery of sheets discharged successively, one immediately following the other, from the sheet-producing machine is regulated by spacing the individual sheets apart along the direction of travel. Thus, there is provided a timed interval between delivery of each sheet and the one that next follows sufficient to allow proper placement of the successive sheets on the stack being formed. For this purpose means are provided for increasing the speed of travel of the sheet at a stage subsequent to discharge from the sheet-producing machine, the increased speed being sufficiently greater than the speed of web travel to effect the desired degree of spacing.

Such means advantageously take the form of sets of feed rollers disposed adjacent the discharge end of the blank-producing machine and spaced sequentially toward the stacking location by distances less, respectively, than the length of a sheet. Disposed to receive sheets immediately upon discharge from the sheet-producing machine and to advance them at web speed are, in the embodiment illustrated, sets 10, 10, see Figs. 1, 2 and 10, of feed rollers. Spaced sequentially therefrom a distance less than the length of a sheet, are sets 11, 11 of feed rollers advantageously of the same structural type, but adapted to advance the sheets at a speed greater than web speed. Each set of feed rollers advantageously comprises a propulsion roller, see 10*a*, 10*a* and 11*a*, 11*a* and cooperating traction effecting rollers, see 10*b*, 10*b* and 11*b*, 11*b*, the said rollers being respectively journaled for rotation between upstanding side members 12*a* and 12*b* of supporting frame 12.

The propulsion rollers 10*a*, 10*a* of the sets 10, 10, are journaled directly in frame side walls 12*a* and 12*b*, and are advantageously driven at substantially the speed of travel of the web by means of a common drive gear 13 meshing with gearing, indicated at 14, which is operatively connected in any suitable well-known manner with the drive mechanism of the sheet-producing machine. The propulsion rollers 11*a*, 11*a*, are also journaled directly in frame side walls 12*a* and 12*b*, and are advantageously driven from a common gear 15, which is in turn driven at desired speed, greater than the speed of the propulsion rollers 10*a*, 10*a*, by an independent motor indicated at 16.

The traction effecting rollers 10*b* and 11*b*, are journaled for free rotation within adjustable spring mountings 10*c* and 11*c*, respectively, and are yieldably urged by such spring mountings into relatively light pressure relation with their corresponding propulsion rollers. The spring mountings 10*c* and 11*c* are secured at spaced intervals along shafts 10—1, 10—1 and 11—1, 11—1, respectively, which extend between frame side walls 12*a* and 12*b* in cooperative vertical alignment with corresponding propulsion rollers. In practice, the spring mountings 10*c* may be adjusted to effect less pressure than is effected by the spring mountings 11*c* so that a sheet, as at 17, received directly from the sheet producing machine by sets of feed rollers 10, 10 may be whisked out from the traction grip thereof, without retardation or injury, when seized by the greater traction grip of the sets of feed rollers 11, 11. Or in certain cases the pressure differential may be reversed so that the sets of feed rollers 10, 10 maintain their traction grip on the sheet while sets of feed rollers 11, 11 ride ineffectively thereon until the sheet is freed from the retarding influence. Again, there may be no pressure differential between the sets of feed rollers, the traction grip thereof being such that each set both grips and slips resulting in travel of the sheet therebetween at a speed which is approximately the average of the differential speeds of the sets of feed rollers.

While sets of pressure-type feed rollers have been found efficient for accomplishing the first stage of the method, other types of feed mechanism such as single suction rollers providing differential degrees of suction may be utilized with substantially like effect.

For supporting the sheets in their travel between the sequentially placed sets of feed rollers, longitudinally extending strips 18 are provided

at spaced intervals across the widths of the propulsion rollers. They are so disposed as to maintain the sheets in proper feeding relation to the sets of feed rollers as the sheets pass from one set to the succeeding set. Such supporting strips 18, in effect, provide a delivery table at the discharge end of the sheet-producing machine.

Pursuant to the second stage of operation, the so separated individual sheets 17, successively delivered, are superimposed one upon the other in the form of successively segregated individual stacks. The stacking is accomplished while progressively withdrawing the bottom of the stack being formed from sheet receiving position.

At the appropriate moment, i. e. upon the completion of formation of an individual stack, the formed stack is segregated from the stack to be formed by the interpositioning of separating means. The stated interpositioning is accomplished at and within the time interval between the delivery of two mutually adjacent sheets.

The rate of progressive withdrawal of the bottom should be faster than the rate of stack formation by an amount sufficient to allow for the thickness of the separating means plus a clearance of at least an inch, the latter being desirable for facilitating removal of the formed stacks individually.

For accomplishing the second stage of operation in a most effective manner, it is preferred to employ apparatus comprising suitably disposed conveyor means correlated in operation with the operation of the sheet-producing machine.

Preferred apparatus, as illustrated in the drawings, includes endless conveyor mechanism disposed for vertical movement in sheet-receiving status adjacent the final set of feed rollers 11.

A vertically disposed box frame 20, comprising the four upright corner posts 20*a*, 20*b*, 20*c*, and 20*d*, supports a primary set 21 of endless conveyor chains, the set consisting of four individual endless chains 21*a*, 21*b*, 21*c* and 21*d*, sprocketed adjacent the four corner posts 20*a*, 20*b*, 20*c* and 20*d*, respectively, and extending vertically from the lower portion of the box-frame to a location slightly above the location of sheet delivery.

A shaft 22 extending horizontally between the corner posts 20*a* and 20*b* adjacent the lower ends thereof is journaled therein for rotation, and a shaft 23, extending horizontally between the lower ends of corner posts 20*c* and 20*d*, at a location horizontally aligned with shaft 22, is journaled therein for rotation. A shaft 24, extending horizontally between corner posts 20*a* and 20*b* at a location vertically spaced above and aligned with shaft 22, slightly above the location of sheet-delivery, is journaled therein, and a shaft 25, extending horizontally between corner posts 20*c* and 20*d* at a location vertically spaced above and aligned with shaft 23, and horizontally aligned with shaft 24, is journaled therein for rotation.

The endless chains 21*a* and 21*b* at their lower ends are looped around and mesh with sprocket wheels 26 and 27, respectively, which are rigidly mounted on the shaft 22 adjacent the corner posts 20*a* and 20*b*, and at their upper ends are looped around and mesh with the sprocket wheels 28 and 29, respectively, the latter being rigidly mounted on shaft 24 at locations vertically aligned with the lower sprocket wheels 26 and 27, respectively. Likewise, endless chains 21*c* and 21*d* at their lower ends are looped around and mesh with the sprocket wheels 30 and 31, respectively, which are rigidly mounted on shaft 23 adjacent the corner posts 20*c* and 20*d*, and at their upper ends are looped around and mesh with the sprocket wheels 32 and 33, the latter being rigidly mounted on the shaft 25 at locations vertically aligned with the lower sprocket wheels 30 and 31, respectively. Thus, in the instant embodiment, there is formed a four-point-suspension endless conveyor adapted to receive four cornered receptacles.

The endless conveyor 21 is actuated in correlation with the operation of the sheet-producing machine in such manner that inner portions of the component endless chains descend progressively and simultaneously to provide a conveying path of travel. To this end, the shafts 22 and 23 may have integral extensions 22*a* and 23*a*, respectively, journaled in the bracket arms 32 and 33, respectively. A horizontal shaft 34 is journaled in the bracket arms 35—1 and 35—2, respectively, and is geared at its ends to the shaft extensions 22*a* and 23*a* by means of respective miter gearing indicated generally at 36—1 and 36—2.

A chain drive 38 may transmit motion from a suitable connection with the sheet-producing machine (not shown), to a main drive shaft 39, the latter being geared at one end by suitable worm gearing, as illustrated, to a crank-shaft 40, see Figs. 2, 3 and 10, journaled in a bearing support 41. A connecting rod 42, having one end journaled on a crank 40*a* which is adjustably mounted in the diametric slideway 40—2*a* of the coupling member 40—2, the latter being rigidly mounted on crank-shaft 40 (Fig. 3), serves to reciprocate the drive arm 43*a* of a suitable usual type of ratchet mechanism, indicated generally at 43 (Fig. 2). Such ratchet mechanism is mounted on the extension 23*a* of shaft 23 and is operatively connected therewith for rotating shaft 23 intermittently. Through connecting shaft 34 this intermittent motion is transmitted to shaft 22, thus motivating the four endless chains 21*a*, 21*b*, 21*c* and 21*d*, simultaneously.

The eccentricity of crank 40*a* with respect to the crank-shaft 40 may be varied by means of the adjusting screw 40—3 to compensate for different thicknesses of web material used from time to time in the sheet-producing machine. Adjustment of screw 40—3 moves crank 40*a* in its slideway 40—2*a* either toward or away from the axis of rotation of crank-shaft 40.

While the above described mechanism has been found satisfactory for actuating the endless conveyor 21 in desired manner from the sheet-producing machine, the invention is by no means limited to its use. Other mechanism, as for instance a solenoid, or the device manufactured by The General Electric Co. commonly known as a "Thruster" automatically electrically controlled by the sheet-producing machine, may be advantageously employed for the same purpose.

Advantageously, an auxiliary set 45 of endless conveyor chains, comprising the component endless chains 45*a*, 45*b*, 45*c* and 45*d*, rises above primary set 21 of endless conveyor chains, and said chains have their lower ends looped around sprocket wheels 46, 47, 48 and 49, respectively, and their upper ends looped around sprocket wheels 50, 51, 52 and 53, respectively. The lower sprocket wheels 46, 47, and 48, 49 are mounted for free rotation on the shafts 24 and 25, respectively, desirably immediately adjacent sprocket wheels 28, 29 and 32, 33, respectively. The upper sprocket wheels 50 and 51 are rigidly

mounted on a shaft 54 which extends horizontally between and is journaled in the upper ends of corner posts 20a and 20b of the box-frame, and the upper sprocket wheels 52 and 53 are rigidly mounted on a shaft 55 which extends horizontally between and is journaled in the upper ends of corner posts 20c and 20d of the box-frame in horizontal alignment with shaft 54. The various shafts and sprocket wheels are aligned horizontally and vertically relative to one another as previously explained with respect to the various shafts and sprocket wheels of the primary set of endless chains. The four endless chains 45a, 45b, 45c and 45d of the auxiliary set 45 thus form a four-point-suspension secondary conveyor adapted to receive four cornered receptacles and to feed them into the primary conveyor 21.

The secondary conveyor 45 is normally actuated in correlation with the descending motion of primary conveyor 21. The inner portions of the component endless chains normally descend progressively and simultaneously at the same rate as do the inner portions of the component endless chains of the primary conveyor 21 to provide a conveying path of travel.

To this end, the lower sprocket wheel 48 of the secondary conveyor 45, see especially Figs. 3, 8 and 10, is provided with a pin 60 extending rigidly from its inner face. A collar 61, having a fork formation formed on its outer circumferential surface by two mutually spaced rigidly extending lugs 61a and 61b, is rigidly mounted on shaft 25 immediately adjacent sprocket wheel 48 in such manner as to receive the pin 60 in the fork formation between the lugs 61a and 61b. When shaft 25 is rotated by the rotation of sprocket wheels 32 and 33, collar 61 rotates therewith carrying lug 61a into contact with pin 60. Thereafter, during rotation of shaft 25, lug 61a normally maintains pressure contact with pin 60 and thereby simultaneously rotates sprocket wheel 48.

The shafts 54 and 55 have integral extensions 54a and 55a, respectively. A horizontal shaft 56, journaled in the bracket arms 57—1 and 57—2, is geared at its ends to the shaft extensions 54a and 55a by means of miter gearing indicated generally at 58—1 and 58—2, respectively.

Because of the interrelated connections of the four component endless chains 45a, 45b, 45c and 45d, rotation of lower sprocket wheel 48, as above described, will actuate the entire set of endless chains of secondary conveyor 45 in the prescribed manner, i. e. at a rate equal to the rate of descent of the primary conveyor 21.

The primary conveyor 21 is adapted to receive and support receptacles, see the receptacles 65, Fig. 3, at successively spaced locations along the length of its descending path. For this purpose, certain corresponding links of each of the component endless chains 21a, 21b, 21c and 21d are provided with fingers extending preferably integrally and perpendicular to the link lengths, into the path of receptacle descent. Such links are indicated at 66, see Figs. 3, 4 and 5, and form successively spaced sets of horizontally aligned fingers for receiving and supporting the receptacles. Their spacing in the respective endless chains depends upon the type of receptacles employed, the desired height of stacks, and the desired clearance between individual receptacles.

The receptacles 65 are preferably introduced manually into the secondary conveyor at the open top thereof. For their support, supporting fingers 67 are articulatively mounted at correspondingly spaced horizontally aligned intervals along the lengths of the component endless chains 45a, 45b, 45c and 45d forming sets of horizontally aligned supporting fingers. Operation of the fingers 67 and their associated mechanism will be discussed at length hereinafter. At the moment, suffice it to say that a set of supporting fingers 67 serves to receive a receptacle 65 and carry it toward and into sheet-receiving position at the top of primary conveyor 21.

Feed of a receptacle 65 from secondary conveyor 45 directly into sheet-receiving position at the top of primary conveyor 21 is accomplished at and during the time interval between delivery of an individual sheet 17 and the individual sheet that next follows. For this purpose, the rate of descent of secondary conveyor 45 is suddenly increased, during the stated time interval, to a rate approximately proportioned one to one with the rate of production of individual sheets in the sheet-producing machine.

In attaining the desired correlation with the sheet-producing machine, mechanism may be mounted on the extension 54a of shaft 54 for operative connection with the main drive shaft 39.

The mechanism advantageously comprises a ratchet type connection with the main drive shaft 39. A ratchet wheel 70, see especially Figs. 3 and 7, having its outer circumferential surface configurated in such manner as to provide a relatively small number of teeth 70a widely separated by substantially smooth arcuate slideway surfaces 70b, each extending from the top of one tooth 70a to the bottom of a next adjacent tooth 70a, is rigidly mounted on the extension 54a of shaft 54 for rotation therewith in the direction of the arrow, Fig. 7. A pawl-supporting plate 71 is journaled on shaft 54 immediately adjacent ratchet wheel 70, and has an opposite end connected by the link 72 to one end of a bell crank 73, the bell crank being journaled on a stub shaft 74, extending rigidly from corner post 20b. The other end of the bell crank 73 journals the upper end of rod 76 which connects with the eccentric 77a of eccentric-carrying shaft 77. Shaft 77 is journaled for rotation in the bearing bracket 78 and is geared to an intermediate shaft 79 by miter gearing 80, the intermediate shaft 79 being journaled in a bracket support extending from frame side member 12a. A gear 81, rigidly mounted on an end of intermediate shaft 79, meshes with a pinion 82 rigidly mounted on main drive shaft 39. Thus, rotative motion is transmitted from main drive shaft 39 (which in turn receives its motion from the sheet-producing machine), through the above described gearing to eccentric carrying shaft 77, from where it is transmitted as reciprocatory motion to pawl-supporting plate 71 by means of the eccentric 77a, the connecting shaft 76, the bell crank 75, and link 72.

A stub shaft 83 extending rigidly from pawl-supporting plate 71 has journaled thereon a pawl 84 adapted to ride along the slideways 70b between teeth 70a of ratchet wheel 70. A leaf spring 85, having one end pinned to pawl-supporting plate 71, yieldably urges pawl 84 against the circumferential surface of ratchet wheel 70.

By reason of its rigid securement on shaft 54, ratchet wheel 70 rotates in the direction of the arrow, Fig. 7. The rotation is normally continuously intermittent by reason of the operative connection of shaft 54 through endless chains 45a and 45b, and the previously described other interrelated mechanism, with shaft 23, which is ro-

tated intermittently at desired speed from main drive shaft 39.

Pawl-supporting plate 71 rocks back and forth continuously on its pivotal mounting on shaft 54 by reason of its previously described operative connection with main drive shaft 39, and carries pawl 84 through the same reciprocatory path. Because the connection with main drive shaft 39 is geared approximately one to one with the production of individual sheets in the sheet-producing machine, while the operative connection of shaft 23 with main drive shaft 39 is geared at a different ratio, the reciprocative stroke of pawl 84 in the direction of rotation of ratchet wheel 70 is accomplished at a speed considerably above the speed of rotation of ratchet wheel 70.

During the continuously intermittent rotation of shaft 54 in the direction of the arrow, see Fig. 7, pawl 84 rides ineffectually through its own reciprocative strokes on the circumferential surface of ratchet wheel 70, until it engages a tooth 70*a* upon a stroke which occurs in the direction of rotation of ratchet wheel 70. Upon such engagement, the pawl 84 pushes ratchet wheel 70, and therewith shaft 54 in the direction of rotation at a speed considerably increased over its normal speed of rotation. At the termination of this tooth-engaging-stroke, pawl 84 again reciprocates ineffectually over the circumferential surface of ratchet wheel 70 as the latter rotates until it once more engages a tooth 70*a*, whereupon the tooth-engaging-stroke, at speed increased over the normal rotative speed of ratchet wheel 70, is repeated.

Increase in the rotative speed of shaft 54, as above described, effects descent of secondary conveyor 45 at the increased rate during the time period of the tooth-engaging reciprocative stroke of pawl 84. Because the lower sprocket wheels 46, 47, 48 and 49 of secondary conveyor 45 are freely rotatable on their respective shafts, and because the distance between the two lugs 61*a* and 61*b* is sufficiently great to provide uninterrupted advance of pin 60 during the increased speed of rotation of sprocket wheel 48, the increased rate of descent of secondary conveyor 45 is possible without interruption of the normal operation of primary conveyor 21.

The sudden increase in the rate of descent of secondary conveyor 45 relative to the rate of descent of primary conveyor 21 accomplishes rapid feeding of a receptacle 65 into sheet-receiving position on a set of supporting fingers 66 at the upper end of primary conveyor 21 within the time interval occurring between the delivery of two mutually adjacent individual sheets 17 from the sheet-producing machine.

The aforedescribed component mechanical elements accomplishing the sudden increase in rate of descent of secondary conveyor 45 must be so related to one another and to the remainder of the stacking mechanism that the stated increased rate of descent occurs at a time interval between delivery of two mutually adjacent individual sheets and at a time when a receptacle 65 is properly positioned in secondary conveyor 45 for feed directly into sheet-receiving position on primary conveyor 21.

While the above described mechanism for attaining momentary travel of secondary conveyor 45 at a suitable velocity greater than the normal velocity of travel thereof, has proved very satisfactory, the present invention in its generic aspect is by no means limited to its use. Other well known mechanism, such as a solenoid automatically electrically controlled by the sheet-producing machine, may be employed for the purpose.

The receptacles 65 may be manually placed on a set of horizontally aligned supporting fingers 67 from the open top of a secondary conveyor 45. For attaining positive feed of the empty receptacles 65 into sheet-receiving position on primary conveyor 21, the fingers 67 are made to articulate and are guided in their articulation with respect to their supporting chains, and have, in addition, locking fingers 90 correlated therewith, see particularly Figs. 4 and 5. Each locking finger 90 is articulatively mounted on an endless chain immediately above a supporting finger 67 for coaction therewith in jaw fashion to positively grip a received receptacle during its down travel. Thus, there are provided horizontally aligned sets of cooperating fingers at spaced intervals along the conveying path of travel of secondary conveyor 45.

Each supporting finger 67 and locking finger 90 is preferably of substantially right-angle plate formation, and is pivoted at approximately its vertex portion to a side of the particular link of the particular endless chain concerned, by means of a stub shaft 67—1 or 90—1, which is desirably an extension of a pivotal coupling between two individual links of the chain.

The stub shafts 67—1 and 90—1 project outwardly from the particular chain links concerned at opposite sides thereof, each stub shaft 90—1 being spaced above its related stub shaft 67—1 a small distance sufficient to provide for jaw action between the two cooperating fingers mounted on the stub shafts.

Each supporting finger 67 has one leg 67*a* which projects into the path of travel of the conveyor proper during the descent of same and is adapted to receive and support one portion of a receptacle 65. The other leg 67*b* depends from the vertex, i. e. location of pivot, and has rigidly secured thereto a roller shaft 67—2 which projects perpendicularly away from the chain proper. A pair of pins 67—3, 67—3 extend rigidly from the supporting finger 67, one on each side of the stub shaft 67—1, to embrace the chain proper in maintaining stability of positioning of the finger relative to its supporting chain.

Each locking finger 90 has one leg 90*a* which is arranged to project into the path of travel of the conveyor proper at an appropriate time during the descent of same, being adapted to lock and hold the received receptacle tightly against the cooperating supporting finger 67. The other leg 90*b* extends upwardly from the vertex, i. e. location of pivot, and has rigidly secured thereto a roller shaft 90—2 which projects perpendicularly away from the chain proper oppositely to the projection of roller shaft 67—2 of cooperating supporting finger 67. A pair of pins 90—3, 90—3 extend rigidly from the locking finger 90, one on each side of the stub shaft 90—1, to embrace the chain proper in maintaining stability of positioning of the finger relative to its supporting chain.

The sets of coacting fingers, each set comprising a supporting finger 67 and a locking finger 90, are guided in their travel along the conveying path of secondary conveyor 45 in a manner to effect cooperative articulation of the two fingers of the set relative to each other. For this purpose, a set of guide plates, each comprising individual guide plates 91 and 92, is positioned adjacent the path of travel of each of

the component endless chains 45a, 45b, 45c and 45d of the secondary conveyor 45, see particularly Fig. 10.

For supporting the sets of guide plates in rigid placement relative to the sets of coacting fingers on the respective component endless chains, bars 93 and 94 extend between and are rigidly secured to corner posts 20a and 20b, and corner posts 20c and 20d, respectively, at locations intermediate the upper and lower shafts 54 and 24, and the upper and lower shafts 55 and 25, respectively. Individual guide plates 91 and 92 of each set are rigidly supported from either bar 93 or bar 94 by means of rigid securement to opposite sides of a supporting extension 95a of a bracket 95, brackets 95 being rigidly secured at appropriate locations on bars 93 and 94. The component guide plates 91 and 92 of each set are thus spaced apart, facing each other in mutual opposition, on opposite lateral sides of the descending portion of a component endless chain of the secondary conveyor 45.

Each guide plate 91 is provided with a guide channel 91—1 which runs vertically adjacent the free edge of the plate at that face thereof proximate the particular chain concerned. The guide channel 91—1 has an upwardly diverging throat 91—1a at the top for receiving the roller shaft 67—2 of a supporting finger 67, and for guiding it into the vertical guide channel proper, 90—1, as the supporting finger 67 descends from the topmost portion of its endless path down into the conveying path of travel of the secondary conveyor, see particularly Figs. 4 and 5. Engagement of the roller shaft 67—2 in the guide channel 91—1 during vertical descent of the supporting finger 67 swings receptacle-receiving leg 67a into horizontal receiving position and maintains it in such position throughout substantially the complete vertical descent. At the end of the vertical descent, when the endless chain executes an arcuate withdrawal from the conveying path of travel of the conveyor, roller shaft 67—2 passes out of the open lower end of guide channel 91—1 and allows supporting finger 67 to assume its natural free hanging position, in which receptacle-receiving leg 67a hangs back out of the conveying path of travel of the conveyor. At the time receptacle-receiving legs 67a withdraws from receptacle-supporting position, the supporting finger 67 has descended into horizontal alignment with the supporting finger 66 of primary conveyor 21. Thus, withdrawal of leg 67a of supporting finger 67 effects transference of load to the supporting finger 66, the withdrawal of receptacle receiving leg 67a providing an uninterrupted path of descent for the receptacle 65 on primary conveyor 21. During the ascending portion of the path of travel of the endless chain, supporting finger 67 rides freely in an inoperative position.

Each guide plate 92 is provided with a guide channel 92—1 extending along the length of the plate at that face thereof proximate the particular chain concerned. The guide channel 92—1 has an upwardly divergent receiving throat 92—1a at its upper end adjacent the edge of securement of the guide plate, the guide channel proper descending vertically therefrom to a location intermediate the upper and lower ends of the guide plate at which it slopes downwardly toward the free edge of the guide plate to form an intermediate guide channel portion 92—1b. The latter connects with a lower guide channel portion 92—1c which is offset from the guide channel proper, in vertical alignment with the lower portion of guide channel 91—1 of guide plate 91. As the locking finger 90 descends from the topmost position in its endless path of travel its roller shaft 90—1 enters throat 92—1a of guide channel 92—1, and by successive engagement with the above described portions of guide channel 92—1, guides the descent of the locking finger along the conveying path of travel of the secondary conveyor 45. During the descent of roller shaft 90—2 along the vertically extending portion of guide channel 92—1 proper, locking leg 90a will be elevated out of the conveying path of travel of secondary conveyor 45, thus, allowing uninterrupted placement of a receptacle 65 on a set of horizontally aligned supporting fingers 67. During the descent of roller shaft 90—2 along portion 92—1b of guide channel 92—1, locking leg 90a will travel downwardly from its elevated position into locking coaction, in jaw fashion, with receptacle-receiving leg 67a of the supporting finger 67 with which it cooperates. During the remainder of the descent of roller shaft 90—2 through lower portion 92—1c of guide channel 92—1, locking leg 90a will be maintained in locking position relative to receptacle-receiving leg 67a of supporting finger 67, and will be carried down into the conveying path of travel of primary conveyor 21. When roller shaft 90—2 passes out of the open lower end of guide channel 92—1, the arcuate withdrawal of its supporting chain will carry it in a gradual arcuate path out of the conveying path of travel of the primary conveyor 21.

From the above, it is clear that after the empty receptacle 65 is received by a set of horizontally aligned supporting fingers 67, it is locked in place during its descent into sheet-receiving position at the top of primary conveyor 21, by the maintained pressure of the cooperating set of horizontally aligned locking fingers 90. Whereupon it is positively transferred to a set of horizontally aligned supporting fingers 66 of primary conveyor 21, and the set of locking fingers 90 gradually withdraw from locking status.

For maintaining the component endless chains 45a, 45b, 45c and 45d of the secondary conveyor taut during the travel thereof, each is provided with an idler sprocket wheel 96 positioned intermediate upper and lower sprocket wheels. Conveniently the brackets 95 are each provided with an adjustable extension 95b in which the idler sprocket wheel 96 is journaled.

Likewise, for maintaining the component endless chains 21a, 21b, 21c and 21d of primary conveyor 21 taut during travel thereof, each is provided with an idler sprocket wheel 97. Bracket arms 98, appropriately mounted on cross bars 99, one of which latter extends between and is rigidly secured to corner posts 20a and 20b, the other extending between and being rigidly secured to corner posts 20c and 20d, serve to journal idler sprocket wheels 97 in proper relation to their respective endless chains.

For maintaining stiffness of the component endless chains of secondary conveyor 45, guide strips 100, one for each of the endless chains, may be properly positioned by securement between the horizontally extending and vertically spaced cross bars 101 and 102 at the outer ends of arms 102—1, 102—1 and 101—1, 101—1, rigidly mounted on the cross bars 102, 101, respectively, and between the horizontally extending and vertically spaced cross bars 103 and 104, at the outer ends of arms 104—1, 104—1 and 103—1,

103—1, rigidly mounted on the cross bars 104, 103, respectively.

Likewise, for guiding the travel of the component endless chains of primary conveyor 21, guide strips 100—1, one for each of the endless chains, may be properly positioned by securement between the horizontally extending and vertically aligned cross-bars 99 and 101 at the outer ends of arms similar to 103—1 and 104—1, and between the horizontally extending and vertically aligned cross-bars 99 and 103 at the outer ends of arms similar to the aforementioned.

To preclude motion of the primary conveyor 21 and secondary conveyor 45 other than through the actuation of the driving mechanism, brakes 105 and 106, respectively, are provided. the shaft 105 is mounted for braking action on the shaft 23, and is provided with a manually adjustable control 105—1. The brake 106 is mounted for braking action on the shaft 55 and is provided with a manually adjustable control 106—1.

Shafts 54 and 55 may be provided with hand wheels 54—1 and 55—1, respectively, for affording manual operation of the conveyor mechanism when desired.

The receptacles 65 are advantageously of open-tray formation having a depth approximately equal to the desired stack height, see particularly Fig. 3. They are provided with means for engaging the receptacle-supporting fingers 67 and 66, such means being, in the illustrated instance, the lateral flanges 65*a*, 65*b*.

To facilitate definite placement of receptacles 65 in secondary conveyor 45 through the open top thereof, and for guiding their descent toward, into, and through the conveying path of travel of primary conveyor 21, back guide strips 107, 107 are provided adjacent the corner posts 20*b*, 20*d* in substantially vertical alignment therewith. They are supported at their upper ends by suitable rigid securement to the horizontally disposed cross bar 108, the latter extending between and being rigidly secured in brackets 108—1, 108—1 which rigidly project from corner posts 20*b*, 20*d*. The strips 107, 107, advantageously extend down to a location adjacent the bottom of primary conveyor 21.

Guide strips 109, 109 are provided along the length of the conveying path of travel of primary conveyor 21, between guide strips 107, 107, for closing the open back end of the receptacles 65 as they descend through the stated path.

The individual sheets 17 are discharged from the delivery mechanism toward the front end of the receptacles 65 with considerable force. A front plate 110 extends completely across the conveying path of primary conveyor 21 at the position of sheet delivery, thus providing a front closure for the sheet-receiving receptacle, and a buffer plate for the sheets as they are delivered. The front plate 110 is journaled on a shaft 110—1, by means of bearing ears 110—2, 110—2, the shaft 110—1 being rigidly mounted in and extending between brackets 110—3, 110—3, the latter being rigidly secured to corner posts 20*a*, 20*c*, respectively. The front plate 110 is normally held in operative position by the spring 110—4 encircling an end portion of shaft 110—1, the spring being anchored at one end to a collar 110—5, which is rigidly mounted on the shaft 110—1, and the other end of the spring being anchored in one of the bearing ears 110—2. The pins 110—6, 110—6 extend rigidly from the respective outer face of bearing ears 110—2, 110—2, to limit-stop positions against lugs 110—7*a*, 110—7*a*, of collars 110—7, 110—7 which are rigidly secured to shaft 110—1. Thus, front plate 110 may be swung downwardly when desired against the returning pressure of spring 110—4 for permitting access to the receptacle 65 in which the stack is being formed.

Knock-down arms 111, preferably of light resilient metal, are rigidly secured on a shaft 112 for up and down oscillatory motion, in and out of a receptacle 65, as the individual sheets 17 are being stacked. The shaft 112 is journaled in bearing arms 113 extending rigidly from the upstanding end frame member 12*c* of frame 12. The shaft 112 is connected by suitable means, such as the rod 114, Fig. 10, with the sheet-producing machine for actuation thereby, there being one up and down stroke of the arms 111 for each sheet delivered. Such strokes are permitted by the spaced successive delivery of the individual sheets.

Lateral jogger plates of a suitable usual type are indicated generally at 115. These may be provided at the location of stack formation to accomplish lateral registry of the superimposed sheets during the stacking operation. A back jogger plate of a suitable usual type, indicated generally at 117 (Fig. 2), is placed at a back location of stack formation.

The bottom of each receptacle 65 is slotted as indicated at 116, Fig. 10, to afford travel thereof past the knock-down arms 111 and the lateral jogger plates 115, as the receptacles are fed into sheet-receiving position.

Individual sheets 17 are successively delivered into a receptacle 65 which is suitably positioned on primary conveyor 21 for the reception thereof. As the sheets are superimposed, one upon another, in the receptacle with the aid of the knock-down arms 111 and jogger plates 115 and 116, the receptacle travels downwardly intermittently but continuously in accordance with the descent of primary conveyor 21.

It is to be noted that the speed of delivery of individual sheets 17 directly into the receptacle 65 is regulated by sets of feed rollers 11, 11, and that the operating speed of such sets of feed rollers may be determined as desired, independently of the speed of operation of the sheet-producing machine, by the independent motor 16. This speed, in the case of freely flexible sheet material, must be sufficiently great to preclude, by the principle of inertia, such buckling of the flexible sheets in their delivery as would interfere with positive superimposition on the stack being formed.

In many cases, especially in those instances where the individual sheets delivered to the stacking mechanism have a tendency to buckle downwardly under their own weight, it has been found highly desirable to employ receptacles of the type illustrated in Fig. 11 and designated 120. Such receptacles are generally similar to the aforedescribed receptacles 65, but are each provided with a bottom 120*a* which slopes downwardly, as respects the horizontal, from sheet-receiving end to the front end. In addition, to prevent the stack of sheets from sliding forwardly out of the receptacle during descent in the primary conveyor, a front wall 120*b* is provided preferably perpendicular to the horizontal, i. e. at an angle less than 90° with the sloping bottom 120*a* of the receptacle.

Where receptacles of the above type are employed, the front plate 110 may be eliminated. Its function is accomplished by front wall 120*b*.

As heretofore described, primary conveyor 21 is correlated in its descending motion with the operation of the sheet-producing machine. By effecting a suitable correlation, the bottom of receptacle 65 in which the stack is being formed may be made to descend faster than the stack is being formed. Thus, when the stack is completely formed, another receptacle 65, fed from secondary conveyor 45 into sheet-receiving position on primary conveyor 21 and in turn intermittently and continuously descending during the formation of a stack therein, may be spaced from the preceding receptacle a distance sufficient to afford ready removal of one with respect to the other. By successively introducing receptacles 65 into secondary conveyor 45, at the appropriate times during operation of the sheet-producing machine, to replace the receptacles fed into primary conveyor 21, individual stacks of sheets are formed successively and continuously and are successively and continuously segregated. The completely formed individual stacks may be removed from the lower portion of primary conveyor 21 as desired.

Endless chain conveyors have proved very satisfactory for accomplishing feed of sheet-receiving receptacles into sheet-receiving position and for removing the same from sheet-receiving position. In its generic aspect, however, the invention is not limited to their use specifically. Other well known types of conveyor means may be employed to substantially like effect for accomplishing the purposes of the invention.

Because of the aforedescribed interrelationship of operation between the sheet-producing machine and the stacking mechanism, a desired definite number of sheets may be predetermined for the respective stacks.

While the illustrated apparatus involves the delivery and stacking of a single longitudinal succession of individual blanks extending completely across the width of the web which is operated upon by the sheet-producing machine, it is distinctly within the purview of the invention to provide for the delivery and stacking of a plurality of longitudinal successions of individual blanks disposed mutually adjacent laterally across the width of the web—and advantageously formed by slitting the web longitudinally—by correspondingly compartmenting the receptacles 65 or 129 across their respective lateral extents, i. e. widths, by supplying a jogger plate 110 and a knock-down arm 111 for each compartment, and by supplying traction rollers 11*b* plus one or more longitudinal supporting strips 18 for each longitudinal succession of individual blanks. Although a preferred embodiment of the apparatus features of the present invention has been illustrated and described herein, it will be understood that various changes may be made in the construction and certain features thereof may be employed without others without departing from the invention or sacrificing any of its advantages.

I claim:

1. Apparatus for stacking sheets which are continuously delivered thereto at spaced intervals, comprising primary conveyor means adapted to carry sheet receiving means at spaced intervals along its length for receiving the sheets delivered thereto; secondary conveyor means disposed in substantial alignment with the primary conveyor means and arranged for travel along a path merging at one end into the path of travel of said primary conveyor means; means for normally actuating both of said conveyor means in the same direction and at substantially the same speed; and means associated with said secondary conveyor means for supporting sheet receiving means and feeding them into said primary conveyor means.

2. Apparatus for stacking sheets which are continuously delivered thereto at spaced intervals, comprising primary conveyor means adapted to carry sheet receiving means at spaced intervals along its length for receiving the sheets delivered thereto; secondary conveyor means disposed in substantial alignment with the primary conveyor means and arranged for travel along a path merging at one end into the path of travel of said primary conveyor means; means associated with said secondary conveyor means for supporting sheet receiving means and feeding them into said primary conveyor means; means for normally actuating both of said conveyor means substantially in synchronism; and means for actuating caid secondary conveyor means at an increased speed at and during predetermined time intervals.

3. Apparatus for stacking sheets which are continuously delivered thereto at spaced intervals, comprising primary conveyor means arranged for substantially vertical descending travel and adapted to carry sheet receiving means at spaced intervals along its length for receiving the sheets delivered thereto; secondary conveyor means disposed above said primary conveyor means for substantially vertical descending travel along a path merging at its lower end into the upper end of the path of travel of said primary conveyor means; means for normally actuating both of said conveyor means in the same direction and at substantially the same speed; and means associated with said secondary conveyor means for supporting sheet receiving means and feeding them into said primary conveyor means.

4. Apparatus for stacking sheets which are continuously delivered thereto at spaced intervals, comprising primary conveyor means arranged for substantially vertical descending travel and adapted to carry sheet receiving means at spaced intervals along its length for receiving the sheets delivered thereto; secondary conveyor means disposed above said primary conveyor means for substantially vertical descending travel along a path merging at its lower end into the upper end of the path of travel of said primary conveyor means; means associated with said secondary conveyor means for supporting sheet receiving means and feeding them into said primary conveyor means; means for normally actuating both of said conveyor means substantially in synchronism; and means for actuating said secondary conveyor means at an increased speed at and during predetermined time intervals.

5. Apparatus for stacking sheets which are continuously delivered thereto at spaced intervals, comprising primary conveyor means arranged for substantially vertical descending travel and adapted to carry sheet receiving means at spaced intervals along its length for receiving the sheets delivered thereto; secondary conveyor means disposed above said primary conveyor means for substantially vertical descending travel along a path merging at its lower end into the upper end of the path of travel of said primary conveyor means; means associated with one of said conveyor means for gripping sheet receiving means; and guiding means for said one conveyor means, and including means for releasing said gripping

means so that the sheet receiving means may be removed therefrom.

6. In combination with a machine which produces individual sheets from a web and with delivery mechanism associated therewith for spacing delivery of the individual sheets at intervals as they are discharged from the machine, stacking mechanism comprising primary conveyor means disposed adjacent the delivery mechanism and adapted to carry sheet receiving means at spaced intervals along its length for receiving sheets as they are delivered from the delivery mechanism; secondary conveyor means disposed in substantial alignment with said primary conveyor means and arranged for travel along a path merging at one end into the path of travel of said primary conveyor means; means for normally actuating both of said conveyor means in the same direction and at substantially the same speed; and means associated with said secondary conveyor means for supporting sheet receiving means and feeding them into said primary conveyor means.

7. In combination with a machine which produces individual sheets from a web and with delivery mechanism associated therewith for spacing delivery of the individual sheets at intervals as they are discharged from the machine, stacking mechanism comprising a frame substantially vertically disposed adjacent the delivery end of said delivery mechanism; a primary conveyor disposed in a lower portion of said frame for substantially vertical descending travel, said primary conveyor extending into sheet-receiving position relative to said delivery mechanism; a secondary conveyor disposed in an upper portion of said frame for substantially vertical descending travel along a path merging at its lower end into the upper end of the path of travel of said primary conveyor; means associated with said primary conveyor for supporting sheet-receiving receptacles at spaced locations along the descending path of travel thereof; means associated with said secondary conveyor for supporting sheet-receiving receptacles and feeding them into said primary conveyor; means for actuating said primary conveyor at a predetermined speed correlated with the speed of sheet delivery thereto; means for normally actuating said secondary conveyor in synchronism with said primary conveyor; and means, correlated with sheet delivery, for actuating said secondary conveyor at an increased speed at and during predetermined time intervals.

8. The combination recited in claim 7 wherein the primary and secondary conveyors comprise sets of endless chains, respectively.

9. The combination recited in claim 7 wherein the primary and secondary conveyors comprise sets of endless chains respectively, and the means for supporting sheet-receiving receptacles comprise sets of horizontally aligned fingers spaced at intervals along the lengths of the endless chains.

10. The combination recited in claim 7 wherein the primary and secondary conveyors comprise sets of endless chains respectively, and the means for supporting sheet-receiving receptacles comprise sets of horizontally aligned fingers spaced at intervals along the lengths of the endless chains, the sets of horizontally aligned fingers associated with the secondary conveyor comprising individual sets of cooperating fingers, each set consisting of a supporting finger articulatively mounted relative to each other for coaction in feeding received receptacles into the primary conveyor.

11. In combination with a machine which produces individual sheets from a web and with delivery mechanism associated therewith for spacing delivery of the individual sheets at intervals as they are discharged from the machine, stacking mechanism comprising a frame substantially vertically disposed adjacent the delivery end of said delivery mechanism; a primary conveyor disposed in a lower portion of said frame for substantially vertical descending travel along a path merging at its lower end into the upper end of the path of travel of said primary conveyor, the lower portion of said primary conveyor and the upper portion of said secondary conveyor being mounted on common shaft means; means associated with said primary conveyor for supporting sheet-receiving receptacles at spaced locations along the descending path of travel thereof; means associated with said secondary conveyor for supporting sheet-receiving receptacles and feeding them into said primary conveyor; means for actuating said primary conveyor at a predetermined speed correlated with the speed of sheet delivery thereto; means associated with said common shaft mounting for normally transmitting motion of the primary conveyor to the secondary conveyor, said means providing for limited motion of the secondary conveyor at a greater than normal velocity; shaft means associated with the secondary conveyor for rotation thereby, normally, and for drive thereof at predetermined intervals; ratchet means rigidly mounted on said shaft means; a drive member for said ratchet means, said drive member being correlated with the sheet-producing machine for predetermined reciprocation continually during operation of the latter, and, further, being adapted to engage said ratchet means only at and during predetermined reciprocative strokes, said ratchet means and drive member being adapted to actuate said shaft means, and therewith said secondary conveyor during said predetermined intervals at a velocity greater than normal.

12. In combination with a machine which produces individual sheets from a web and with delivery mechanism associated therewith for spacing delivery of the individual sheets at intervals as they are discharged from the machine, stacking mechanism comprising a frame substantially vertically disposed adjacent the delivery end of said delivery mechanism; a primary conveyor disposed in a lower portion of the frame for substantially vertical descending travel, said primary conveyor comprising a set of four substantially vertically disposed endless chains spaced apart mutually in horizontal alignment to provide four-point suspension for receptacles received by said conveyor, said set of endless chains extending upwardly into sheet-receiving position relative to the delivery mechanism; horizontally disposed shaft means interconnecting the lower loops of said endless chains to one another for simultaneous actuation; sprocket wheels rigidly mounted on said shaft means and engaging said lower loops of the endless chains; horizontally disposed shaft means interconnecting the upper loops of said endless chains to one another; sprocket wheels rigidly mounted on said last named shaft means and engaging said upper loops of the endless chains; a secondary conveyor disposed in an upper portion of the frame for substantially vertical descending travel along a path merging at its lower end into the upper end of the path of

travel of said primary conveyor, said secondary conveyor comprising a set of four substantially vertically disposed endless chains spaced apart mutually in horizontal alignment to provide four-point suspension for receptacles received by said conveyor, the last named set of endless chains extending downwardly substantially into sheet-receiving position relative to the delivery mechanism, the lower loops of the component endless chains thereof being interconnected by the said shaft means which serve to interconnect the upper loops of the component endless chains of the said primary conveyor; sprocket wheels mounted for free rotation on the last named common shaft means and engaging said lower loops of the component endless chains of the secondary conveyor; horizontally disposed shaft means interconnecting the upper loops of the component endless chains of the secondary conveyor; sprocket wheels rigidly mounted on the last named shaft means and engaging said upper loops of the component endless chains of the secondary conveyor; receptacle-receiving fingers spaced at corresponding intervals along the lengths of the component endless chains of the primary conveyor forming sets of horizontally aligned receptacle-receiving fingers spaced at intervals along the descending path of travel of the primary conveyor proper; sets of cooperating fingers, comprising a lower receptacle-receiving finger and an upper locking finger articulatively mounted relative to each other for coaction in feeding received receptacles into the primary conveyor, spaced apart at corresponding intervals along the lengths of the component endless chains of the secondary conveyor forming sets of horizontally aligned sets of fingers spaced at intervals along the descending path of travel of the secondary conveyor proper; guide plates associated with each of the component endless chains of the secondary conveyor for engaging portions of the fingers of each of said sets of fingers to guide the cooperative articulation of said fingers; drive means connected with the said shaft means which interconnect the lower loops of the component endless chains of the primary conveyor, for actuating the primary conveyor faster than the rate of stack formation; connecting means associated with the said shaft means which serves in common to interconnect the upper loops of the component endless chains of the primary conveyor and the lower loops of the component endless chains of the secondary conveyor, for normally transmitting motion of the primary conveyor to the secondary conveyor while providing for limited free motion of the secondary conveyor at a greater than normal velocity; a ratchet wheel rigidly mounted on the shaft means which interconnects the upper loops of the component endless chains of the secondary conveyor, said ratchet wheel having teeth spaced by a distance determined by the time interval elapsing between delivery of two mutually adjacent sheets from the sheet producing machine; a drive pawl for said ratchet wheel mounted for continuous reciprocating in the direction of normal rotation of the ratchet wheel at a speed correlated with the operating speed of the sheet-producing machine, said drive pawl being adapted to reciprocate ineffectually between two mutually adjacent teeth of the ratchet wheel as the ratchet wheel rotates normally, and being adapted to engage a tooth of the ratchet wheel at intervals for increasing the velocity of rotation of the ratchet wheel to equal the velocity of a forward reciprocative stroke of the pawl at and during said reciprocative stroke.

13. Apparatus for stacking sheets which are continuously delivered thereto at spaced intervals, comprising conveyor means; means for actuating said conveyor means at a predetermined speed; means secured to said conveyor means for gripping a sheet receiving receptacle; and guiding means for said conveyor means, and including means for actuating said gripping means as the conveyor means moves therethrough.

14. Apparatus for stacking sheets which are continuously delivered thereto at spaced intervals, comprising primary conveyor means adapted to carry sheet receiving means at spaced intervals along its length for receiving the sheets delivered thereto; secondary conveyor means disposed in substantial alignment with the primary conveyor means and arranged for travel along a path merging at one end into the path of travel of said primary conveyor means; means associated with said secondary conveyor means for supporting sheet receiving means and feeding them into said primary conveyor means; and means for gripping said sheet receiving means while they are carried by said secondary conveyor means and releasing them as they are fed into said primary conveyor means.

15. Apparatus for stacking sheets which are continuously delivered thereto at spaced intervals, comprising conveyor means; means for actuating said conveyor means at a predetermined speed; means associated with said conveyor means for gripping a sheet receiving receptacle; and means for releasing said gripping means at a predetermined point in the travel of said conveyor means.

16. Apparatus for stacking sheets which are continuously delivered thereto at spaced intervals, comprising conveyor means; means for actuating said conveyor means at a predetermined speed; means associated with said conveyor means for gripping a sheet receiving receptacle; means for actuating said gripping means to cause it to grip a sheet receiving receptacle at a predetermined point in the travel of said conveyor means; and means for releasing said gripping means at a predetermined point in the travel of said conveyor means.

17. Apparatus for stacking sheets which are continuously delivered thereto at spaced intervals, comprising primary conveyor means adapted to carry sheet receiving means at spaced intervals along its length for receiving the sheets delivered thereto; secondary conveyor means disposed in substantial alignment with the primary conveyor means and arranged for travel along a path merging at one end into the path of travel of said primary conveyor means; means associated with said secondary conveyor means for supporting sheet receiving means and feeding them into said primary conveyor means; means for gripping said sheet receiving means while they are carried by said secondary conveyor means and releasing them as they are fed into said primary conveyor means; means for normally actuating both of said conveyor means substantially in synchronism; and means for actuating said secondary conveyor means at increased speed at and during predetermined time intervals.

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