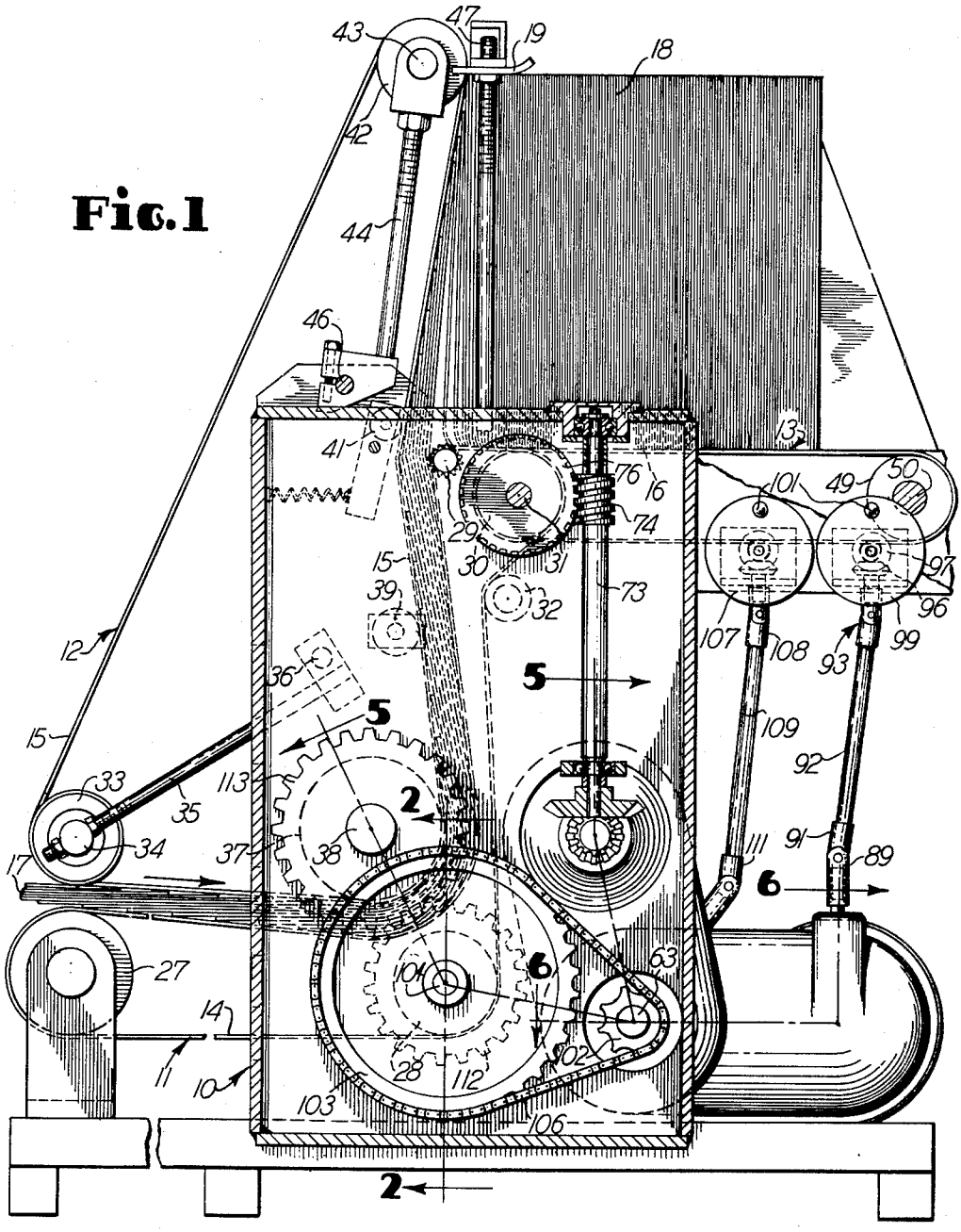
April 19, 1960 A. R. STOBB 2,933,313

METHOD AND MEANS FOR COLLECTING FLEXIBLE SHEETS

Filed Jan. 27, 1958 4 Sheets-Sheet 1

Fig. 1



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METHOD AND MEANS FOR COLLECTING FLEXIBLE SHEETS

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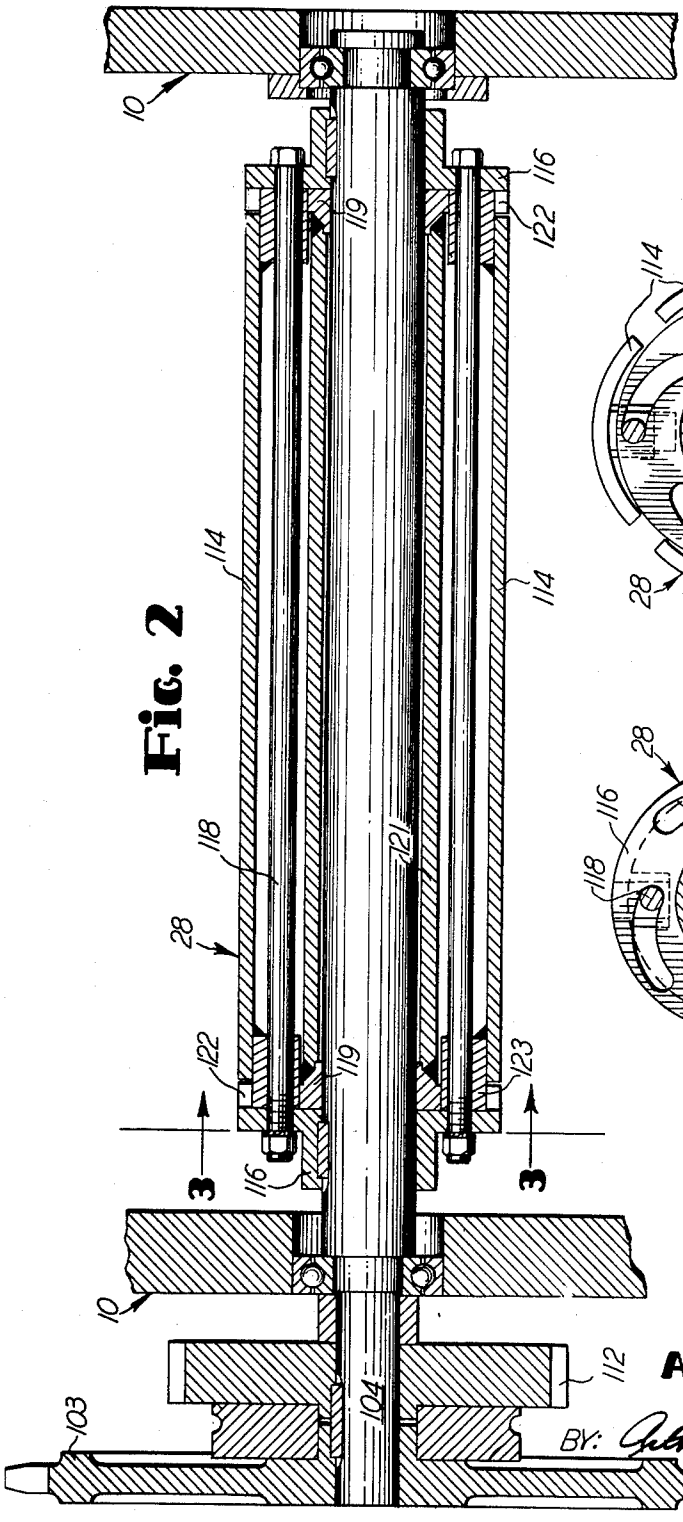

Fig. 2

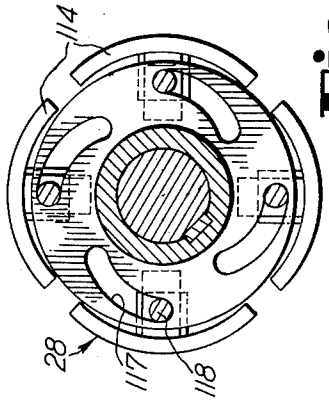

Fig. 4

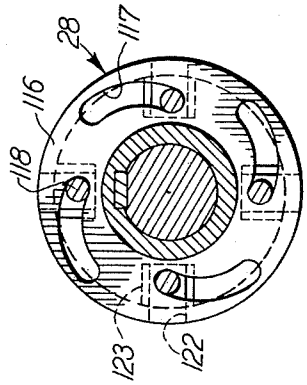

Fig. 3

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METHOD AND MEANS FOR COLLECTING FLEXIBLE SHEETS

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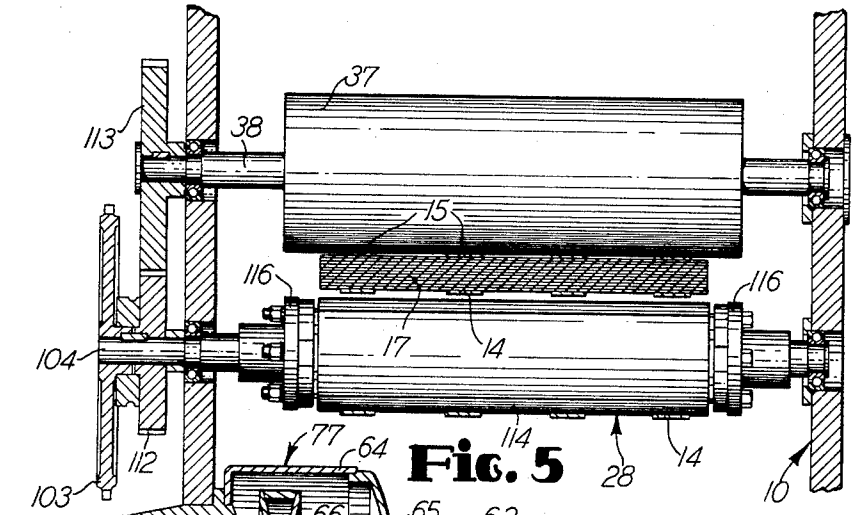

Fig. 5

Fig. 6

Fig. 8

Fig. 9

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METHOD AND MEANS FOR COLLECTING FLEXIBLE SHEETS

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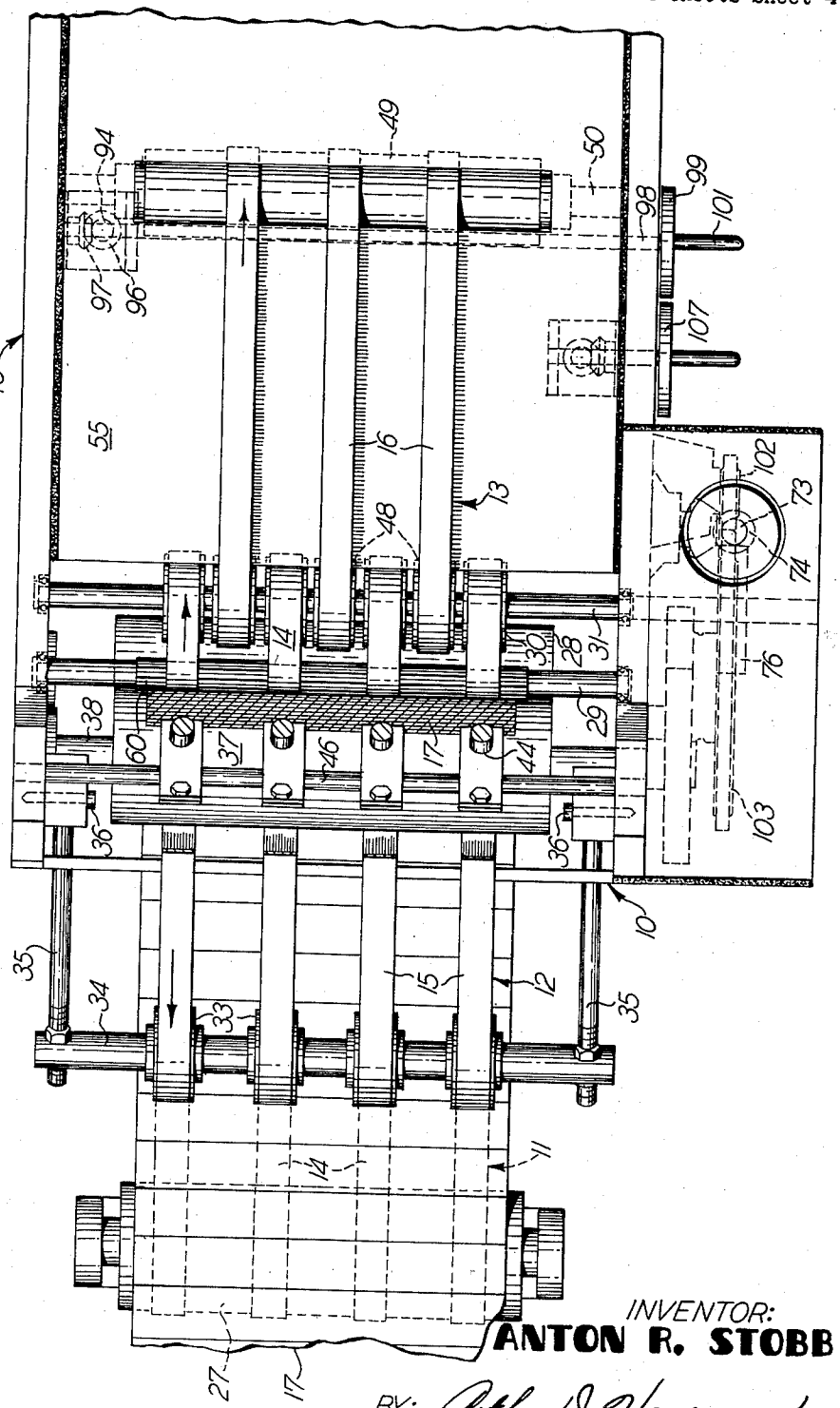
4 Sheets-Sheet 4

Fig. 7



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2,933,313

METHOD AND MEANS FOR COLLECTING FLEXIBLE SHEETS

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Application January 27, 1958, Serial No. 711,516

15 Claims. (Cl. 271—68)

This invention relates to a method and a means for collecting flexible sheets, and, more particularly, it relates to the control of the speed of the sheets at different phases of their travel from a source to a receiver or box. Also see my companion Patent No. 2,933,314, application Serial No. 711,515.

Flexible sheets, such as printed signatures of books, magazines, newspapers, pamphlets, etc., can be passed from a source, such as a printing press or a folder, onto a conveyor which deposits the sheets in a receiver or box without interruption of the flow of the sheets. Normally, the sheets issue from the source at a continuous and high rate of speed since the press and/or the folder are operated at the high rate of speed. It has long been the concern of the graphic arts industry to stack the printed sheets into bundles so they can be tied for shipping. Frequently, the work of two or three laborers is required to scoop the sheets off the conveyor and stack and pack them and then tie them. Even then, where the sheets are folded, there is no easy way to adjust or control the folds, even though the folds might not be exactly as desired because of the problems inherent in sheet folding, including varying sheet thicknesses, the number of sheets folded together, the number of folds, control of the light weight sheets affected by atmospheric pressure, and like factors affecting the folds. It should be understood that the sheets are normally fed from the source and onto a conveyor which operates at a speed related to the speed of the feed so that the sheets are echeloned or overlapped on the conveyor.

It is an object of this invention to provide a method and means of collecting flexible sheets, especially those which are folded into signature form, wherein the speed of the sheets is controlled at different phases of their travel from a source to a receiver or box. In accomplishing this object, accommodation can be made for different signatures of different thicknesses so that their speed in the receiver, for instance, can be regulated according to signature thicknesses.

Another object of this invention is to provide a method and means of collecting flexible sheets wherein the speeds of the opposit faces of the sheets are controlled. In accomplishing this object, the folds in the sheets can be either maintained in their original folded condition, if they are acceptable, or their folds can be altered by increasing the speed of one face of the sheets as related to the other face of the sheets. Also, better control of the sheets and their folds can be maintained when the path of the sheets is angled.

Other objects and advantages will become apparent upon reading the following description in light of the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a sheet collector showing a preferred embodiment of this invention with parts thereof sectioned and with parts broken away.

Fig. 2 is an enlarged sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 3 but showing parts thereof in different positions.

Fig. 5 is a sectional view taken on the angled section line 5—5 of Fig. 1.

Fig. 6 is a sectional view taken on the angled section line 6—6 of Fig. 1.

Fig. 7 is a top plan view of the collector shown in Fig. 1, but with parts broken away and with the stack removed.

Fig. 8 is an enlarged side elevational view of one form of a folded signature passed through the machine.

Fig. 9 is an enlarged side elevational view of another form of a folded signature passed through the machine.

Similar reference numerals refer to similar parts throughout the views.

Figs. 1 and 7 best show the overall arrangement of the collector which generally includes a frame 10 which partly supports one conveyor 11 and a second conveyor 12 and a third conveyor 13. These conveyors are shown to respectively consist of a plurality of belts 14, 15 and 16 which extend between the limits of each respective conveyor with the belts trained over rollers or pulleys as shown. The movement of the belts is as indicated by the arrows shown adjacent each belt in Fig. 1, and this movement of the belts or conveyors mentioned transports flexible sheets 17 between the conveyors 11 and 12 from the horizontal position at the left of the view to a vertical position in the center of the view, at which point the conveyor 13 engages the signatures 17 which are shown to form a stack 18, and the conveyor 13 moves the stack of signatures to the right, as viewed in Fig. 1. It should also be understood that the signatures or sheets 17 are laid upon the lower conveyor 11 as the signatures pass from a sheet folding device (not shown) which processes the sheets at a uniform rate and delivers them onto the conveyor 11 at said uniform rate so that the signatures 17 are overlapped and echeloned, as shown in their position on the conveyor 11. In this arrangement, the signatures 17 form a stream with the leading edge of each signature in contact with the conveyor 12, and it should also be noticed that the stack 18 is formed to the side of the stream opposite to the side where the signature leading edge is located. In this arrangement, the signatures are automatically deposited onto the conveyor 11 and transported between the conveyors 11 and 12 to the conveyor 13 with the signatures being stripped from their stream position and off the conveyor 12 by means of a stop 19.

The important feature of this invention resides in the control of the speed of the conveyors 11, 12 and 13 in that the speeds of these three conveyors can be varied with respect to each other so that one speed of conveyor 11, for instance, does not result in only one speed for each of the conveyors 12 or 13. In providing for these different speed, and in achieving this goal, the speed of conveyor 13 can be regulated and set according to the thickness of the signatures 17 so that when the latter are deposited in the stack 18, the conveyor 13 will move the stack at a rate of speed corresponding to the rate of increase in the stack which, in turn, is, of course, dependent upon the thickness of the signatures coming into the stack 18. Of course, it is the intent and desire that the stack 18 be tightly packed so that the signatures in the stack are ready for binding when the stack is of a certain length or when there is a certain number of signatures in the stack. Also, to vary the speed of the conveyor 11 with respect to the conveyor 12 will actually control and affect the fold in the signatures 17 in that, for instance, if the signatures are folded such that the actual fold or line of crease is toward the top of the

signature, rather than on the horizontal center plane as in the case of a perfect fold, then an increase in the speed of the conveyor **11** will actually cause the lower face or side of the signatures to be drawn more rapidly into the bite or junction between the conveyors **11** and **12**, and thus the fold in the signatures would be placed in the exact desired position. On this latter point, Fig. 8 shows a signature **17** with its leading end of travel being the open end and its trailing end of travel being the end having the fold or crease line **21**, and it is assumed that the line of fold is above the top of the horizontal center plane of the signature, as mentioned in the foregoing. It should thus be understood that if the lower face **22** of the signature is moved into the bite between the conveyors **11** and **12** at a speed faster than the movement of the upper face **23** of the signature, then the lower face **22** will be advanced slightly with respect to the face **23**, and such advance will cause the crease line **21** to be lowered to the horizontal center plane of the signature, as desired. Of course, when the signatures **17** are overlapped and echeloned, as desired, the whole lower face **22** and the full upper face **23** of each signature is not in contact with the respective conveyors **11** and **12**, but the latter conveyors do contact a portion of the faces, and the speeds of the signature faces can be governed as described to control the location of the fold or crease line **21**.

Fig. 9 shows another form of the signature **17**, and in this instance two folds or crease lines **24** and **26** are formed. Again, it is assumed that the folds are not tight and each line may be above its desired position. In this instance, if the conveyor **12** is faster than the conveyor **11**, the front edge of the signature will become aligned and the folds **24** and **26** will fall into place.

It should, of course, also be understood that when, for instance, thick signatures are being fed through the collector to the stack **18**, then the speed of the conveyor **11** should be increased since the conveyor travels to the outside of the curved path of the stream of signatures, and naturally the outside path is longer than the inside path taken by the conveyor **12**, and, accordingly, the conveyor **11** should move faster.

The preferred mechanism for accomplishing the function and desired result mentioned will now be described. It will be understood that the conveyor **11** is trained about a roller or pulley **27**, and passes a roller **28**, a shaft **29**, and pulleys **30** rotatable on a shaft **31**, from where the conveyor **11** returns to the roller **27** after it passes a rotatably mounted belt guide **32**, and is trained about the roller **28**, and the conveyor, of course, continues back to the roller or pulley **27** such that the conveyor is endless and trained about the rollers, pulleys, and shafts described and shown.

Also, the conveyor **12** is shown trained about pulleys **33** rotatably mounted on a shaft **34** which is supported on a rod **35** with the latter being adjustably mounted on the side panels of the frame **10** by virtue of the attachment to two trunnions **36** which can be adjustably rotated and secured in position on the frame **10** in any well-known manner. Thus, the extended end of the rod **35** carrying the pulleys **33**, as shown in Figs. 1 and 7, provides for selective positioning of the shaft **34** and, therefore, the pulleys **33** can be positioned as desired. The conveyor **12** continues around a roller **37**, which is, of course, rotatably mounted in the frame **10** on the shaft **38**, and the conveyor is then directed upwardly past rotatably mounted belt tighteners **39** and **41**, and the conveyor continues thereabove to another series of pulleys **42** which are mounted for rotation on their shafts **43**. Thus, the pulleys **42** can be adjustably positioned as their mounting rod **44** is pivotally attached to the frame by the shaft **46**, and in this manner, it will be understood and apparent that a like number of pulleys **42** is provided to have the belts **15** aligned with the pulleys **33**, and each of the four pulleys **42**, which match with the four pulleys **33**, can be independently positioned by pivotal positioning of each rod **44** about the mounting shaft **46** so that the pulleys **42** can be selectively disposed in the longitudinal plane of the stack **18**. Thus, the path of the conveyor **12** is traced as outlined and, of course, the belts are endless and continue around in the path outlined. At this moment, it should also be noticed that the stop **19** which strips the signatures from the conveyor **12** can, of course, be mounted on the upstanding post **47**, and such mounting would preferably be adjustable so that the stop **19** could move downwardly, for instance, from its shown position to accommodate signatures of a shorter length and, accordingly, the height of the stack **18** would be less than that shown.

The conveyor **13** is shown in Fig. 7 to be trained between the series of pulleys **48** mounted on the shaft **31** for rotation therewith, and the conveyor extends to the roller **49** which is mounted on the shaft **50** so that the roller **49** can rotate.

It will, of course, be noticed that in the echeloned relation of the signatures **17**, they are normally spaced one behind the other a distance greater than the thickness of each signature, and this means that the stack **18** will move at a speed slower than the edgewise speed of the incoming stream of signatures at the entrance end of the receiver **55** which supports the stack **18**. Accordingly, the speed of the conveyor **13** is less than that of the conveyors **11** and **12**, and since the shaft **29** at the entrance of the stream into the receiver or box **55** is powered to rotate with the faster conveyor **11**, knurled or fine-toothed rollers **60**, mounted on the shaft **29** for rotation therewith, will engage the bottom or trailing edges of the signatures **17** to flare or urge them along the receiver **37** as shown in Fig. 1. In this manner, the lower or trailing edges of the signatures are moved away from the incoming stream of signatures so that the stream has more freedom and space to enter the receiver and form the stack. Of course, the knurling or teeth on the rollers **60** provide a means for frictionally and positively engaging the trailing edges of the signatures and advancing them in the manner emphasized in Fig. 1.

In tracing the drive of the various conveyors, Figs. 1, 5, and 6 show a driving motor **51** with its output shaft **52** having an expandable pulley **53** mounted thereon, such that the pulley is, of course, driven to impower a V-belt **54** trained over the pulley, and also trained over another expandable pulley **56** mounted on and for rotation with a shaft **57**. One end of the shaft **57** has a gear **58** which meshes with a gear **59** supported on a shaft **61** which is, of course rotated, through the power system mentioned, upon operation of the motor **51**. Fig. 5 shows the shaft **61** to extend to a coupling **62** having a square socket for rotating the shaft **61** and for rotating a shaft **63** in the other end of the coupling **62**. Shaft **63** extends into a pulley housing **64** and has an expandable pulley **66** mounted on the shaft for rotation therewith and for driving a V-belt **67** which also is trained on an expandable pulley **68** mounted on a shaft **69** for rotation therewith. The output of the shaft **69** is transmitted to a bevel gear **71** which is in mesh with another bevel gear **72** on the lower end of an upstanding shaft **73** which is non-rotatably supported in the frame **10** in a conventional manner. Fig. 1 shows that the upper end of the shaft **73** has a worm **74** mounted thereon for engagement with a worm wheel **76** mounted on the shaft **31** such that the power train induces rotation of the shaft **31**. Since the belts **16** of the conveyor **13** are trained over the pulleys **48** mounted on the shaft **31**, the belts **16** are driven by the power transmission described.

From the foregoing, it will be understood that operation of the electric motor **51** rotates the shaft **63** in the variable speed pulley unit **77** which includes the parts described above. It will also be noticed that both of the variable speed pulley units **77** and **78** are adjustable so that the output speeds of the take-off or output shafts **61** and **69** can be varied. To this end, it will be seen in Figs. 1 and 6 that an axial thrust cup or member **79** is mounted on the shaft **52** for axial movement therealong

without impeding rotation of the pulley 53, and a link 81 is pinned to the member 79, and another link 82 is pivotally mounted by a pin 84 on the housing 83 of the unit 78. A threaded stud 86 extends through the wall of the housing 83 and through a fixedly mounted threaded socket 87, and the stud 86 has a square end 88 which is rotatably attached and axially movable in a square socket 89. The latter socket is shown in Fig. 1 to be one part of a universal joint with the other part of the joint being the member 91 which has an extension rod 92 attached thereto. The rod extends to a second universal joint 93, and the upper end of the joint 93 has a shaft 94 attached thereto for rotation with the rod 92, and for supporting a bevel gear 96. Also see Fig. 7. The gear 96 is in mesh with another bevel gear 97 which is non-rotatably attached to a shaft 98 which, in turn, is attached to a hand wheel 99 having a handle 101. Thus, upon rotation of the hand wheel 99, the bevel gears 96 and 97 are rotated to rotate the rod 92 and the stud 86 which is axially displaced in its threaded socket 87. If the hand wheel 99 where rotated to have the stud 86 move downwardly, as viewed in Fig. 6, that is, out of the housing 83, the pulleys 53 would expand as the belt 54 is pulled radially inward on the pulley by virtue of a compression spring 100 exerting an axial force on the expandable pulley 56 to move the belt 54 radially outward on the pulley 56. The expansion of the pulley 53 would reduce the speed of the belt 54, and the speeds of the shafts 57 and 61 would also be reduced. Accordingly, the shaft 63 of the expanding pulley unit 77 would be reduced in speed so that the expandable pulley shaft 69 and the worm wheel shaft 73 would be reduced in speed to reduce the speed of the conveyor 13. This variable speed pulley unit shown is of a conventional design, and no claim is herein made to the invention of it.

When the speed of the shaft 63 is reduced, then a sprocket 102 mounted to rotate with the shaft 63 is also reduced in speed and, correspondingly, the speed of a sprocket 103 mounted on the shaft 104, on which is located the roller 28, is reduced in speed. A chain 106 drivingly connects the sprockets 102 and 103 in the usual manner. It will thus be seen that adjustment of the variable speed unit 78 also affects the speed of the roller 28.

Referring again to the expandable pulley unit 77, it will be seen that adjusting means similar to that described in connection with the unit 78 are attached to the unit 77 for governing the speeds of the output shaft 69. Thus, the speed of the conveyor 13 can be further governed by adjusting the hand wheel 107 which connects through the universal joint 108, the shaft 109, and the universal joint 111, to another stud 86 for movement of another thrust bearing member 79 shown in Fig. 5 on the shaft 63. By this arrangement, the conveyor 13 is further governed in its speed, and such governing at this point is independent of the adjustment of the variable speed unit 78 which drives the conveyor 11 through the chain and sprocket mentioned.

Figs. 1, 5 and 7 also show that a spur gear 112 is mounted on the shaft 104 for rotation therewith, and the gear is in mesh with another spur gear 113 which is mounted on the shaft 38 to rotate the latter along with its roller 37. Thus, the conveyors 11 and 12 are geared together through the spur gears mentioned, but the following described parts make possible different speeds between the conveyors 11 and 12. Figs. 2 and 3 particularly, show the roller 28 to be expandable in that the roller is composed of four arcuate sections or segments 114 which are movable radial of the roller shaft 104 to expand and contract and thus govern the linear speed of the belts 14 trained around the roller 28. The roller is shown to be provided with an end plate or hub 116 keyed on each end of the shaft 104 with the hubs 116 being left and right handed to include respective arcuate slots 117 which are cam slots as disposed. A stud

118 is extended through each pair of slots 117, and the stud is secured to the hubs by virtue of the bolt heads and nuts shown. A flange or circular member 119 is mounted on each end of the shaft 104 to be rotatable with respect to the shaft, and a cylinder 121 is attached between the members 119 to form a spool-like assembly, such that the entire assembly can rotate together as one unit. Also, the flange members 119 have radial slots 122 disposed therein for receiving blocks 123. The blocks 123 are shown welded to the segments 114 so that radial movement of the blocks induces radial movement of the segments 114, and such movement of the blocks 123 is induced by rotation of the segments 114 to move the studs 118 in the cam slots 117 while the hubs 116 are held against rotation through the shaft 104 and its gear 103. Such rotation of the segments 114 is possible upon loosening of the nuts on the ends of the studs 118, and the members 119 will rotate slightly on the shaft 104. Fig. 4 shows the expanded position of the roller 28 while Fig. 3 shows the contracted position of the roller, and it will thus be noted in comparing the two figures that the rods or studs 118 are at different positions in the slots 117 between the two views. Also, the views show the shaft 104 to have been rotated.

Thus, when the roller 28 is expanded as shown in Fig. 4 for any given speed of rotation of the shaft 104, the speed of the belts 14 will be increased. In this manner, the relative speed between the conveyors 11 and 12 can be controlled and varied.

While a specific embodiment of this invention has been shown and described, it should be obvious that certain changes could be made therein, and the scope of this invention should, therefore, be limited only by the appended claims.

What is claimed is:

1. In a method of collecting flexible sheets folded into signatures, the steps comprising disposing said signatures in echeloned and overlapped relation with the folds thereof oriented transverse to the direction of echelon, moving said signatures in their edgewise direction of echelon to form a stream of said signatures, moving the one side on one boundary plane of said signatures in said stream at a speed relative to the other side on the other boundary plane of said signatures for moving said folds with respect to the remainder of said signatures, and interrupting the edgewise movement of said signatures for causing the latter to form a stack angularly disposed to said stream within the extent of the terminal end thereof.

2. In a method of collecting flexible sheets folded into signatures, the steps comprising disposing said signatures in echeloned and overlapped relation with the folds thereof oriented transverse to the direction of echelon, moving said signatures in their edgewise direction of echelon to form a stream of said signatures, moving the one side on one boundary plane of said signatures in said stream at a speed relative to the speed of the other side on the other boundary plane of said signatures for moving said folds with respect to the remainder of said signatures, interrupting the edgewise movement of said signatures for causing the latter to form a stack angularly disposed to said stream within the extent of the terminal end thereof, and moving said stream and said stack at speeds independent of each other and with said stack speed regulated according to both the signature thickness and the rate of signatures forming said stack.

3. In a method of collecting flexible sheets folded into signatures, the steps comprising disposing said signatures in echeloned and overlapped relation in a first plane with the folds thereof oriented transverse to the direction of echelon, moving said signatures in their edgewise direction of echelon to form a stream of said signatures and angling said stream through a bend and into a second plane, moving the sheets of said signatures in said stream and on the longer radii side of said bend at a speed different from the speed of said sheets of said signatures on

the shorter radii side of said bend for moving said folds with respect to the remainder of said signatures, and interrupting the edgewise movement of said signatures for causing the latter to form a stack angularly disposed to said stream within the extent of the terminal end thereof.

4. In a method of collecting flexible sheets folded into signatures, the steps comprising disposing said signatures in echeloned and overlapped relation in a horizontal plane with the folds thereof oriented transverse to the direction of echelon, moving said signatures in their edgewise direction of echelon to form a stream of said signatures, directing said stream through a bend and into an upright plane, moving the side of said signatures on the longer radii side of said bend at a speed relative to the speed of the other side of said signatures on the shorter radii side of said bend, interrupting the edgewise movement of said signatures and aligning the leading edges thereof for causing said signature to form a stack angularly disposed to said upright plane and to said stream and be within the extent of the terminal end of said stream, and governing the speed of said stack separate from the speed of said stream.

5. A collector for flexible sheets comprising a first conveyor and a second conveyor with each including a portion parallel to a portion in the other conveyor and with said portions disposed for supporting said sheets therebetween in an echeloned and overlapped relation and for moving said sheets in a stream in their edgewise direction with the trailing edges of said sheets in contact with said first conveyor, said portions being disposed through a bend for directing said stream upwardly, means in separate driving relation to each said conveyor for driving each said conveyor at a different speed relative to the speed of the other said conveyor, and a stripper disposed at the downstream edge of said stream for stacking said signatures.

6. A collector for flexible sheets comprising a first conveyor and a second conveyor with each including a portion parallel to a portion in the other conveyor and with said portions disposed for supporting said sheets therebetween in an echeloned and overlapped relation and for moving said sheets in a stream in their edgewise direction and through a bend transverse thereto and with the trailing edges of said sheets being on one side of said stream and in contact with said first conveyor, a third conveyor angularly disposed to said stream at a downstream location from the terminal end of said stream and to said one side thereof, a stripper mounted at said terminal end of said stream for interrupting edgewise movement of said signatures and stacking the latter on said third conveyor, and drive means in independent driving relation to each said conveyor for driving each said conveyor at speeds relative to the speed of the other said conveyors.

7. A collector for flexible sheets of folding signatures, comprising a first conveyor and a second conveyor with each including a portion parallel to a portion in the other conveyor and with said portions disposed partly in a first plane and supporting said sheets between said portions in an echeloned and overlapped relation and for moving said sheets in a stream in their edgewise direction with the trailing edges of said sheets in contact with said first conveyor, said portions of said conveyors formed to include a bend for directing said stream into a second plane angled upwardly from said first plane, means in independent driving relation to each said conveyor for driving each said conveyor at a speed relative to the speed of the other said conveyor, and a stripper disposed at the downstream edge of said stream for stacking said signatures.

8. A collector for flexible sheets comprising a first conveyor and a second conveyor with each including a portion parallel to a portion in the other conveyor and with said portions disposed for supporting said sheets therebetween in an echeloned and overlapped relation and for moving said sheets in a stream in their edgewise direction with the trailing edges of said sheets being on one side of said stream and in contact with said first conveyor, a third conveyor angularly disposed to said stream at a downstream location from the terminal end of said stream and to said one side thereof, a stripper mounted at said terminal end of said stream for interrupting edgewise movement of said signatures and stacking the latter on said third conveyor, first drive means connected between said first conveyor and said second conveyor for transmitting driving power therebetween and forming a unit therebetween, a prime mover, an output shaft rotated by said prime mover and connected to said unit for driving the same, and second drive means connected between said prime mover and said third conveyor for driving the latter independent of the speed of said output shaft.

9. A collector for flexible sheets comprising a first conveyor and a second conveyor with each including a portion parallel to a portion in the other conveyor and with said portions disposed for supporting said sheets therebetween in an echeloned and overlapped relation and for moving said sheets in a stream in their edgewise direction with the trailing edges of said sheets being on one side of said stream and in contact with said first conveyor, a third conveyor angularly disposed to said stream at a downstream location from the terminal end of said stream and to said one side thereof, a stripper mounted at said terminal end of said stream for interrupting edgewise movement of said signatures and stacking the latter on said third conveyor, first drive means connected between said first conveyor and said second conveyor for transmitting driving power therebetween and form a unit therebetween, a prime mover, a first variable speed transmission disposed between said prime mover and said unit, and a second variable speed transmission disposed between said prime mover and said third conveyor.

10. A collector for flexible sheets comprising a first conveyor and a second conveyor with each including a portion parallel to a portion in the other conveyor and with said portions disposed for supporting said sheets therebetween in an echeloned and overlapped relation and for moving said sheets in a stream in their edgewise direction with the trailing edges of said sheets being on one side of said stream and in contact with said first conveyor, a rotatably mounted shaft included in said first conveyor, a third conveyor angularly disposed to said stream at a downstream location from the terminal end of said stream and to said one side thereof, a stripper mounted at said terminal end of said stream for interrupting edgewise movement of said signatures and stacking the latter on said third conveyor, first drive means connected between said shaft of said first conveyor and said second conveyor for transmitting driving power therebetween and form a unit therebetween, an expandable roller mounted on said shaft of said first conveyor for varying the speed of the latter, a prime mover, a first variable speed transmission disposed between said prime mover and said unit, and a second variable speed transmission disposed between said prime mover and said third conveyor.

11. A collector for flexible sheets of folded signatures, comprising a set of first belts and a set of second belts with each set including a portion parallel to a portion in the other set of belts and with said portions disposed for supporting said sheets therebetween in an echeloned and overlapped relation and for moving said sheets in a stream in their edgewise direction with the trailing edges of said sheets in contact with said first belts, a set of rollers or pulleys rotatably mounted for supporting each set of said belts, a shaft rotatably mounted and included in each set of said rollers or pulleys to provide two shafts, drive means connecting said two shafts together for rotation at a related speed, an expandable roller mounted on one of said shafts and having said belts of one said set trained thereover for altering said speed of the latter said belts upon expansion or contraction of said expandable roller,

and means for aligning said leading edges of said sheets to form a stack.

12. A collector for flexible sheets of folded signatures, comprising a first conveyor and a second conveyor with each including a portion parallel to a portion in the other conveyor and with said portions disposed for supporting said sheets therebetween in an echeloned and overlapped relation and for moving said sheets in a stream in their edgewise direction with the trailing edges of said sheets in contact with said first conveyor, a rotatably mounted first shaft included in said first conveyor, means for removing said sheets from said stream and forming a stack, a third conveyor for supporting said stack, a prime mover, a first and a second variable speed pulley unit driven in series by said prime mover, said first variable speed pulley unit including an output shaft in driving relation to said first shaft of said first conveyor, drive means disposed between said first shaft and said second conveyor, an expandable roller mounted on said first shaft for altering the speed of said first conveyor upon expansion or contraction of said roller, an input shaft and a take-off shaft included in said second variable speed pulley unit, said output shaft being in direct drive with said input shaft, and transmission means disposed between said take-off shaft and said third conveyor.

13. A collector for flexible sheets of folded signatures, comprising a first conveyor and a second conveyor with each including a portion parallel to a portion in the other conveyor and with said portions disposed for supporting said sheets therebetween in an echeloned and overlapped relation and for moving said sheets in a stream in their edgewise direction with the trailing edges of said sheets in contact with said first conveyor, a rotatably mounted first shaft included in said first conveyor, means for removing said sheets from said stream and forming a stack, a prime mover, a first and a second variable speed unit driven in series by said prime mover, said first variable speed unit including an output shaft in driving relation to said shaft of said first conveyor, drive means disposed between said first shaft and said second conveyor, an input shaft and a take-off shaft included in said second variable speed unit, said output shaft being in direct drive with said input shaft.

14. A collector for flexible sheets of folded signatures, comprising a first conveyor and a second conveyor with each including a portion parallel to a portion in the other conveyor and with said portions disposed for supporting said sheets therebetween in an echeloned and overlapped relation and for moving said sheets in a stream in their edgewise direction with the trailing edges of said sheets in contact with said first conveyor, a rotatably mounted first shaft included in said first conveyor, means for removing said sheets from said stream and forming a stack, a third conveyor for supporting said stack, a prime mover, a first and a second variable speed unit driven in series by said prime mover, said first variable speed unit including an output shaft in driving relation to said first shaft of said first conveyor, drive means disposed between said first shaft and said second conveyor, an input shaft and a take-off shaft included in said second variable speed unit, said output shaft being in direct drive with said input shaft, and transmission means disposed between said take-off shaft and said third conveyor.

15. A collector for flexible sheets folded into signatures, cimprising a pair of conveyors disposed for supporting said sheets therebetween in an imbricated stream relation and for moving said sheets in their edgewise direction and with the folds thereof being transverse to the direction of imbrication and movement, another conveyor angularly disposed to said stream, means adjacent the terminal end of said stream for interrupting edgewise movement of said sheets and stacking the latter on said another conveyor, and a variable speed drive means connected to said pair of conveyors for moving one thereof at a selected speed relative to the speed of the other thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,063,338	Duncan	June 3, 1913
2,140,112	Novick	Dec. 13, 1938
2,233,850	Rapley	Mar. 4, 1941
2,392,746	Labombarde	Jan. 8, 1946
2,678,716	Apgar	May 18, 1954