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L. J. CHASE
WORK-TURNING MACHINE

2,823,788

Filed Aug. 6, 1956

3 Sheets-Sheet 1

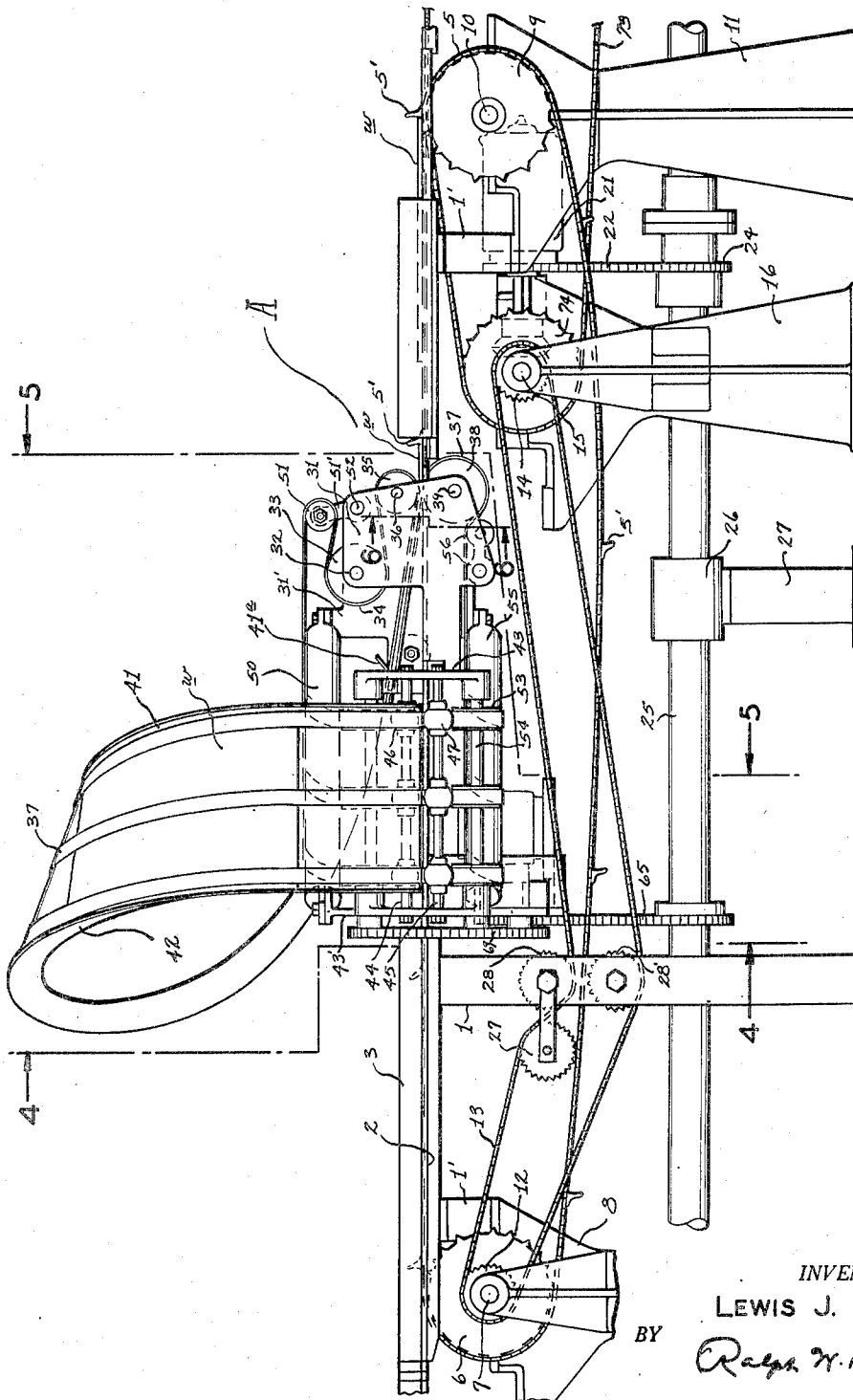


FIG. 1

INVENTOR.
LEWIS J. CHASE

BY *Ralph W. Kalish*

ATTORNEY

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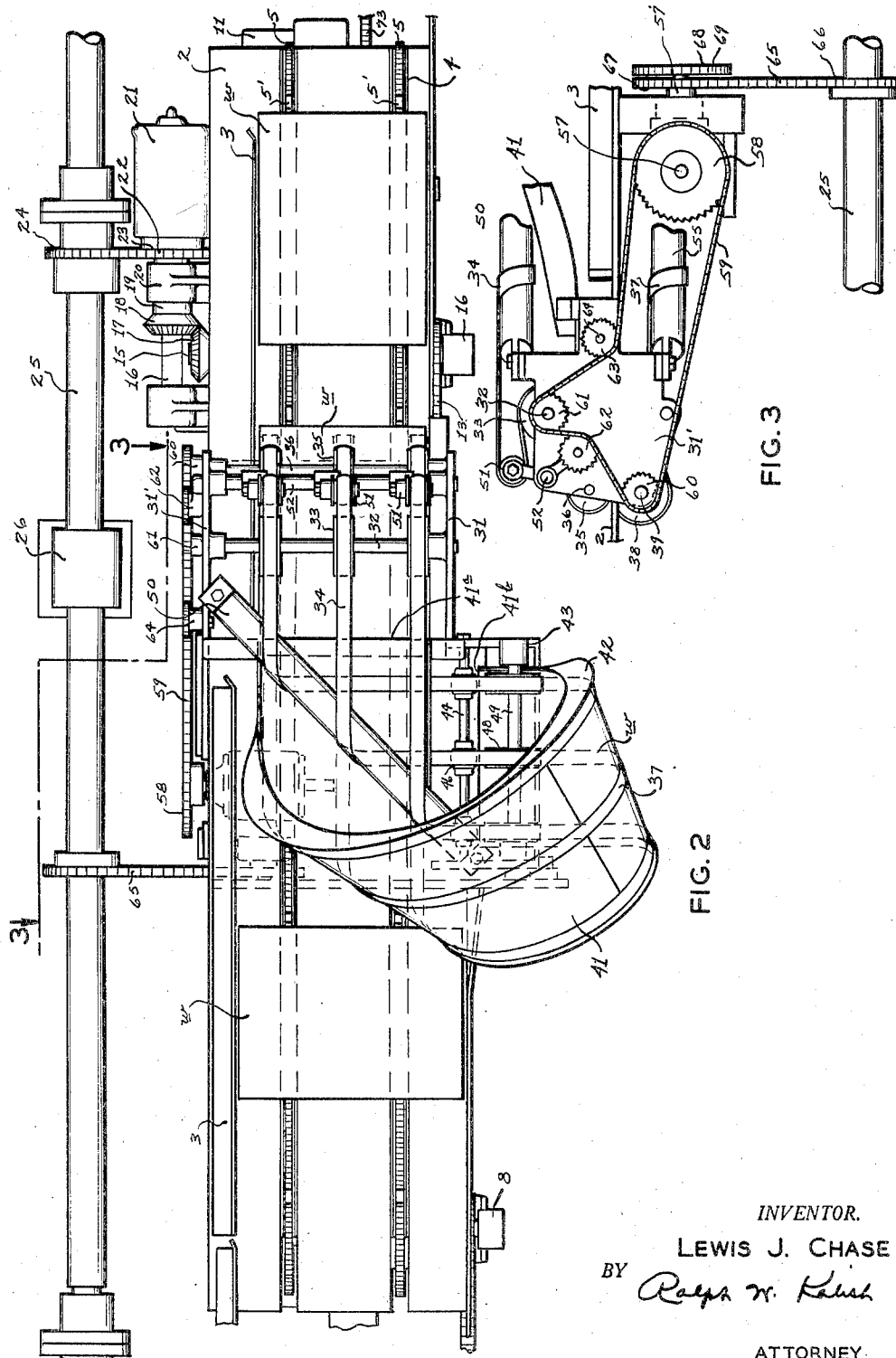


FIG. 3

FIG. 2

INVENTOR.

LEWIS J. CHASE

BY

Ralph W. Kunk

ATTORNEY.

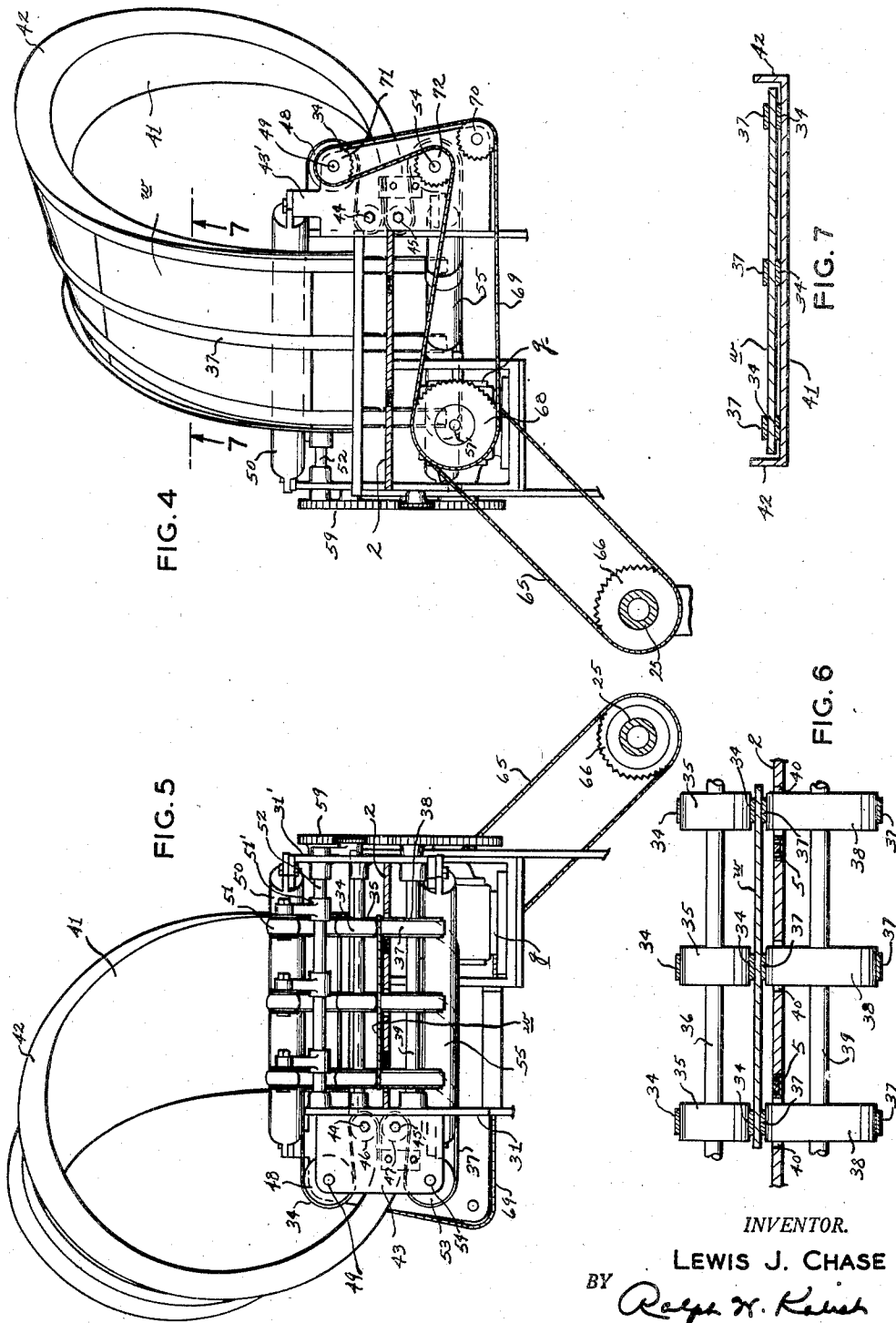
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INVENTOR.

LEWIS J. CHASE

BY *Ralph H. Ketch*

ATTORNEY

1

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WORK-TURNING MACHINE

Lewis J. Chase, Sparta, Ill., assignor to The World Color Printing Company, St. Louis, Mo., a corporation of Missouri

Application August 6, 1956, Serial No. 602,168

14 Claims. (Cl. 198—33)

This invention relates primarily to certain new and useful improvements in work-turning devices.

In numerous assembly line procedures, it is often requisite that work proceeding from one operation be turned or altered in attitude for effective presentation for the next succeeding operation. The necessity of such a step is encountered with regularity in the printing field, such as especially in the production of magazines and the like, wherein booklets of different styles are formed from the same stock. The stacked and aligned constituents, the covers and pages, will be presented to the stitching and folding machine usually either in an endwise or a cross-wise attitude, depending upon the character of the booklet to be produced therefrom. Normally, with the stacked material moving in an endwise manner, the same will be stitched and folded along its transverse median line for forming a booklet the length of which will be equivalent to the width of the stock. However, in the production of the ever increasing popular small, hand-size magazine, it is necessary to present the stacked material to the folding and stitching machine in such manner that it may be stitched and folded along its longitudinal axis, whereby booklets of reduced width will result. Thus, in the latter case, the gathered or assembled material must be turned, through a 90° arc, so as to be presented in a cross-wise manner to the stitching and folding machine.

Heretofore, various inadequate efforts have been made to turn the work after it leaves the gathering machine. Among the expedients attempted has been the obvious one of manually turning the work, but such a method is costly from a labor standpoint and tends to slow down the rate of production. Also, there have been contrived highly complex, oscillatable devices for receiving the work, turning and discharging same, and then being returned to initial position, but such have proved unreliable in operation, being subject to breakdown, as well as being quite expensive in construction.

Therefore, it is a primary object of the present invention to provide a work-turning machine incorporating a path-forming member of such contour that work moving therealong will be turned through a predetermined angle.

Another object of the present invention is to provide a work-turning machine of the character stated which may be readily incorporated in an assembly line system, so that work proceeding from one operation may be delivered to the work-turning machine, and delivered therefrom for the next operation in pre-determined, altered attitude.

It is a further object of the present invention to provide a work-turning machine of the character stated having associated therewith work-gripping means directed for travel about the path-forming member, adapted to reliably receive the work, securely maintain same during the turning operation, and discharge same upon completion thereof.

It is an additional object of the present invention to provide a work-turning machine of the character stated which may be most economically manufactured; which is durable and reliable in operation, not being subject to ready

2

breakdown with attendant high maintenance costs; which does not require the attendance of an operator; and which does not require costly installation for integration with already existing equipment.

5 These and other detailed objects are obtained by the structures illustrated in the accompanying drawings (three sheets) in which—

10 Figure 1 is a side elevation of a work-turning machine constructed in accordance with and embodying the present invention.

Figure 2 is a top plan view.

Figure 3 is a side view taken on the line 3—3 of Figure 2.

15 Figure 4 is a vertical transverse section taken on the line 4—4 of Figure 1.

Figure 5 is a vertical transverse section taken on the line 5—5 of Figure 1.

Figure 6 is a vertical transverse section taken on the line 6—6 of Figure 1.

20 Figure 7 is a horizontal transverse section taken on the line 7—7 of Figure 4.

Referring now by reference characters to the drawings which illustrate the preferred embodiment of the present invention, A generally designates a work-turning machine primarily designed for integration within a system for the production of reading matter, such as magazines, booklets, pamphlets, and the like, which system customarily includes a gathering machine for the assembly and aligned stacking of the component cover and pages of each unit, and a folding and stitching machine for receiving the stacked material and completing the booklet formation by the stitching of the constituents and folding. The machine of the present invention is adapted for disposition intermediate the aforesaid machines whereby the stacked material would be conveyed thereto for turning through a pre-determined angle for delivery therefrom to the folding and stitching machine for folding along the dimension requisite for the particular booklet. For purposes of orientation, the gathering machine would be connected, through a conveyor, to the forward end of machine A or to the right hand side of Figure 1, while the folding and stitching machine would be similarly connected to machine A at its rearward end or at the left hand side of Figure 1.

45 Machine A comprises a main frame, having a plurality of verticals or uprights 1, including short support arms 1' integral with pedestal members, for supporting an elongated bed plate 2 for travel therealong of the work w which may be the gathered sheet material, but may be any similar type of flat work; there being upstanding guide plates 3 along side margins of said bed plate 2 and the latter is provided substantially throughout its length with a pair of spaced apart, slot-like openings 4, for movement therethrough of the upper course of companion, endless conveyor chains 5, each of which carries at pre-selected intervals upstanding work engaging lugs 5'. In their rearward portions each chain 5 is engaged about a sprocket 6 fixed on a shaft 7 journaled in bearings in the upper, bifurcated end of a pedestal 8 at the rearward end of machine A, while the other or forward end portion of each conveyor chain 5 is disposed about a sprocket 9 fixed on a shaft 10 supported for rotation in bearings provided on a pedestal 11; said shafts 7, 10 thus being axially parallel, and located beneath bed plate 2 in transverse relationship thereto.

70 The driving means for effecting continuous travel of chains 5 includes a drive chain 13 engaging at one end a sprocket 12 keyed or otherwise suitably mounted upon shaft 7, adjacent one end thereof, and disposed at its other end about a sprocket 14 secured upon a shaft 15 accommodated in bearings at the upper end of a pedestal 16; on its end remote from said sprocket 14, shaft 15

3

mounts a driven gear 17 meshing with a drive gear 18. Said drive gear 18 is secured upon a short shaft 19, axially perpendicular to shaft 15 and journaled in a bearing 20 and a bearing box 21. Shaft 19 is engaged by means of a drive chain 22 and sprockets 23, 24 to a main drive shaft 25 extending lengthwise of machine A and being journaled in bearings 26 formed at the upper ends of short standards 27. Drive shaft 25 is operatively connected at one end to a prime mover (not shown). Thus, by operation of drive shaft 25 rotation is imparted to shaft 19 by means of drive chain 22, and thence through gears 18, 17 to shaft 15, and by chain 13 to shaft 7 for effecting travel of conveyor chains 5. With reference being made to Figure 1, it will be noted that an adjustable guide sprocket 27 and a pair of idler sprockets 28, 28' are respectively mounted upon an upright 1, proximate pedestal 8, for the development of selected tension upon drive chain 13.

Provided on the main frame in vertical relation to bed plate 2 and on opposite sides of the central portion thereof are parallel side plates 31, 31', extending both above and below bed plate 2. Journaled in bearings provided on the inner, confronting faces of side plates 31, 31' and extending transversely therebetween in the upper rearward portion thereof, spacedly above bed plate 2, is a shaft 32 upon which is mounted a plurality of spaced apart pulleys 33, which may be any desired number, but are shown as being three in the present instance. About each pulley 33 there is trained a belt 34 which is led forwardly from the under side of its related pulley for extension about an aligned guide pulley 35 carried upon an adjustable, eccentric shaft 36 supported in bearings on side plates 31, 31' in the forward portion thereof and immediately above bed plate 2; said shaft 36 being eccentrically mounted to provide adjustment.

Each belt 34 is directed upwardly and rearwardly from its respective guide pulley 35 and each is in face-to-face registration with a cooperating belt 37 trained about a pulley 38 suitably fixed upon a shaft 39 journaled in bearings on side plates 31, 31' in the forward portion thereof beneath bed plate 2; there being openings 40 in bed plate 2 for extension upwardly therethrough of the upper portions of said pulleys 38. It will thus be seen that belts 37 extending about the forward portions of their associated drive pulleys 38 are brought upwardly into immediate juxtaposition with their respective companion belts 34. Each of said shafts 32, 36, 39 project outwardly beyond side plate 31' for purposes presently appearing.

Said registering pairs of belts 34, 37 are continued upwardly and rearwardly from their meeting point for direction about the outwardly presented surface of a scroll or path-forming member 41, fabricated preferably of sheet metal and having retaining side elements 42. Said scroll 41 is suitably mounted on the main frame, projecting upwardly above bed plate 2, and is of general spiral formation, being coiled through an angle of 90° so that its forward or leading edge 41a is normal to its rearward or discharge edge 41b. The former is presented in transverse or perpendicular relation to bed plate 2, being located spacedly above same; while the latter is axially parallel to bed plate 2, being located adjacent one side edge thereof (see Figures 2 and 4). Belts 34, 37 being in face-to-face relation snugly move along the outer face of scroll 41; said belts being fabricated so that their exterior surfaces are relatively smooth for limiting friction with scroll 41 and thereby facilitating free travel therealong. The inwardly directed or confronting surfaces of belts 34, 37 are relatively coarse or roughened for reliably gripping therebetween the work units *w* delivered to the belts by chain lugs 5'. By use of scroll 41, the stacked work units *w*, moving from the gathering machine, are traveling in what might be termed an endwise manner, that is, with their longest dimension coincident with the axis of bed plate 2, whereby the same being

4

gripped sandwichingly between belts 34, 37, being carried thereby along the exterior of scroll 41 and returned to bed plate 2 at the rearward edge 41b of scroll 41 in a crosswise manner, having been thus turned through an arc of 90° by scroll 41 so that the work units *w* will thus be delivered to the folding and stitching machine in such attitude. Thus, the work units traveling toward the work-turning machine and those traveling away will be coplanar but with their primary or longest axis in perpendicular relationship.

Secured on the main frame, projecting laterally outwardly therefrom, both above and below bed plate 2, on either side of the discharge end portion of scroll 41, are parallel side plates 43, 43', being perpendicular to plates 31, 31'. Extending between side plates 43, 43' immediately above and below bed plate 2, and mounted for rotation, are shafts 44, 45 respectively, each of which carries a plurality of spaced apart, aligned guide pulleys 46, 47, respectively, for engagement thereof of belts 34, 37, respectively. Belts 34 are directed upwardly by their associated guide pulleys 46 and thence outwardly for upward training about the outer faces of pulleys 48 secured upon a shaft 49 journaled in bearings on side plates 43, 43' in their upper, outward portions. From pulleys 48, belts 34 are returned inwardly above bed plate 2, transversely thereto, and are turned forwardly through an angle of 90° about a directing bar 50, which is disposed spacedly above bed plate 2 and maintained at its ends by supports on side plates 31', 43'. The axis of said bar 50 is substantially at a 45° angle to longitudinal axis of bed plate 2, extending obliquely thereacross, so that belts 34 being led upwardly and forwardly thereabout are brought into axial parallelism with bed plate 2, for training about pulleys 33, subsequent to each being moved about an adjustable idler pulley 51 having an integral arm and sleeve 51' for selected positionment upon a shaft 52 extending between side plates 31, 31' in their upper, forward portions. Belts 37 follow a correspondingly similar path from the discharge edge 41b of scroll 41 to the point of registration with belts 34, as the same are led downwardly about guide pulleys 47 and thence outwardly about pulleys 53 mounted upon shaft 54 supported in bearings on side plates 43, 43' in their lower portion. Said belts 37 are then directed inwardly beneath bed plate 2 and upwardly and forwardly about a directing bar 55, parallel to bar 50, whereby belts 37 are thus turned through an angle of 90°, for travel beneath bed plate 2 and axially parallel thereto for engagement about their related pulleys 38, as above described. Bars 50, 55 provide thus a quarter turn to belt 34, 37 respectively, since pulleys 48 and 33, and 53, 38 respectively, are presented for rotation about mutually normal centers. Furthermore, the spacing between the various belts 34, and the various belts 37, for effective engagement of the work units *w* is preserved by the use of bars 50, 55. Suitably mounted, as upon a shaft between side plates 31, 31', rearwardly of pulleys 38, are idlers 56 for guiding and tensioning of belts 37.

Power means for effecting travel of belts 34, 37 incorporates a gear reduction box *g* mounted beneath bed plate 2 upon the main frame, provided with co-planar, axially normal shafts 57, 57'. Keyed or otherwise secured on the outer end of shaft 57 is a sprocket 58 engaging one end of a drive chain 59 which extends forwardly, outwardly of side plate 31', as may best be seen in Figure 3, for engagement with sprockets 60, 61 fixed on the projecting ends of shafts 39, 32, respectively; there being idler sprockets 62, 63 secured upon shaft 52 and a stub shaft 64, respectively.

Shaft 57' is operatively connected to drive shaft 25 by a drive chain 65 through means of sprockets 66, 67, respectively secured thereon. Also carried on said shaft 57', outwardly of sprocket 67, is a sprocket 68 about which is disposed one end of a chain 69, which engages a guide sprocket 70 on a stub shaft mounted on the rear-

5

wardly directed face of side plate 43' from which sprocket, chain 69 is led upwardly for connection about a sprocket 71 carried on the outer projecting end of shaft 49, and from which chain 69 passes about a sprocket 72 secured upon the outer end of shaft 54.

In view of the foregoing, the operation of machine A should be quite evident, for the same is adapted to receive the work proceeding from the gathering machine and to turn same through a 90° angle for delivery to the folding and stitching machine so that the work unit may be folded along the desired dimension. It will be seen that machine A obviates the necessity of laborious and costly manual turning of the work units *w* as has heretofore been widely practiced and also, through its simplicity of construction is resistant to breakdown with attendant expensive repair as has been consistently encountered with the oscillatable devices attained.

It is apparent that if desired, machine A can be modified so as to turn the work through any angle but for practical purposes the quarter turn provided is satisfactory.

The machine of the present invention is of simple construction incorporating the two sets of belts 34, 37 which are adapted to be brought into registry for gripping work units *w* delivered thereto by lug 5' of conveyor chains 5, and to discharge same for return to the conveyor after having traveled through the prescribed angle; said belts 34, 37 being thus parted adjacent the discharge end of scroll 41 are moved in spaced-apart alignment to the point of meeting for receiving another work unit *w*. It is to be recognized that through the drive means provided conveyor chains 5 are adapted to travel at such a rate as to present their lugs 5' in requisite position for engaging work units *w* returned to said conveyor chains 5 after movement about scroll 41, whereby the now turned work unit *w* can be efficiently delivered to the folding and stitching machine.

Referring to Figure 1 there is partially shown a drive chain 73 engaged about a sprocket 74 on shaft 15 which chain 73 extends forwardly for connection to the gathering machine for integrating the operation of the same with machine A. It is apparent that any means well within the ability of an individual skilled in the art could be adopted for integrating the operation of the machines of which machine A is a part.

Shaft 36 is eccentrically mounted for an additional purpose and that is to permit desired adjustability for thickness of the work accommodated. Thus, if, as in the present instance, magazines of varying thickness were to be conveyed through machine A it would be necessary to bring belts 34, 37 closer together or farther apart in correspondence to the thickness of the particular work, so that the latter could be reliably and retentively gripped therebetween. The eccentric mounting of shaft 36 will thus allow for the vertical adjustability necessary to render machine A versatile with works of varying thickness. Similarly, shaft 44 at the discharge end of scroll 41 may be eccentrically mounted so as to permit corresponding adjustability.

Although hereinabove machine A has been described primarily for use in connection with stacked sheet material, it is manifest that it could be readily adapted for handling various other types of work material, preferably, however, that of a normally flat character which would have sufficient inherent pliability or flexibility for snug conformity to the particular contour of the scroll utilized.

It will be readily seen that in the event it is desired that work proceeding from the gathering machine be delivered to the folding and stitching machine in like attitude, machine A could be readily disengaged so that work units proceeding along bed plate 2 will continue to the folding and stitching machine without being in any way affected by machine A. The disengagement of the latter from this system is quite evident in that belts 34,

6

37 will be detached and hence, not disposed for contacting the work proceeding beneath scroll 41. Therefore, the use of machine A provides a very desired versatility not hitherto available with the use of the highly complex, oscillatable devices, since the machine of the present invention can be easily integrated into the existing system or just as easily disengaged therefrom.

It should be understood that changes and modifications in the formation, construction, arrangement, and combination of the several parts of the work-turning machine may be made and substituted for these herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. A work turning machine comprising a generally vertical spiral path-forming member having a leading edge and a discharge edge, said member being contoured so as to dispose said edges at an angle of less than 180° to each other, and work-engaging means adapted for conforming travel about one surface of said member.

2. A work turning machine comprising a generally vertical spiral path-forming member having a leading edge and a discharge edge, said member being contoured so as to dispose said edges at an angle of less than 180° to each other, work gripping means adapted for conforming travel about one surface of said member, and conveying means for receiving work from said gripping means after traverse of said member.

3. A work turning machine comprising a generally vertical spiral path-forming member having a leading edge and a discharge edge, said member being contoured so as to dispose said edges at an angle of less than 180° to each other, a plurality of cooperating work engaging elements adapted for conforming traverse about one surface of said member, and means for conveying work to said member and receiving same therefrom after travel thereabout.

4. A work turning machine comprising a generally vertical spiral track having its end edges axially perpendicular, a plurality of cooperating work gripping members adapted for travel about one surface of said track in registering relationship, means for parting said cooperating members adjacent one end edge of said track, and means for presenting said members in confronting, face to face relation adjacent the other end edge of said track.

5. A work turning machine as described in claim 4 wherein said work gripping members are flexible continuous belts, and means for presenting work to said belts at substantially the point at which same are brought into registry.

6. A work turning machine comprising a surface-forming member for movement therealong of work units, a track disposed in generally vertical relationship to said surface-forming member, said track being of spiral form and contoured so that its forward and rearward end edges are non-parallel, the forward end edge of said track being disposed above said surface-forming member, work engaging means adapted for travel about said track, and means associated with said surface-forming member for delivering work units to said work engaging means and for receiving work units therefrom consequent to their travel about said track.

7. A work turning device comprising a generally vertical spiral track having forward and rearward end edges, said track being so formed as to present its said end edges in mutually axial perpendicular relationship, horizontal work conveying means disposed beneath said track, the forward edge of said track being spaced above and transversely to said work conveying means, flexible work-engaging means for receiving work from the work conveying means and adapted for movement about said track and for returning said work to the conveying means.

8. A work turning device as described in claim 7 wherein the work-engaging means comprises cooperating

7

belt members in confronting relationship for grippingly receiving the work therebetween, means for bringing said belt members into abutting registry in advance of the forward edge of said track, means for separating said belts at substantially the rearward edge of said track.

9. A work turning machine comprising horizontally disposed conveyor means for work units, a spiral track in vertical relationship to said conveyor means having a forward edge and a rearward edge, said forward edge being presented above said conveyor means and axially perpendicular thereto, said rearward edge being presented at one side of said conveyor means in axial parallel relationship thereto, cooperating belt members for gripping work units therebetween and adapted for travel about said track, first pulley means for bringing said belt members into abutting registry in advance of the forward edge of said track for receiving work from said conveyor means, second pulley means for separating said belt members at the rearward end of said track for release of the work units for return thereof to the conveyor means, and drive means for effecting continuous movement of said belt members.

10. A work turning machine comprising a horizontal bed and a generally vertical spiral path-forming member presented upstandingly of said bed and having a leading edge and a discharge edge, said member being contoured so as to dispose said edges at an angle of less than 180° to each other, and work-engaging means adapted for conforming traverse about one surface of said member.

11. A work turning machine comprising a horizontal bed and a generally vertical spiral path-forming member

8

presented upstandingly of said bed and having a leading edge and a discharge edge, said member being contoured so as to dispose said edges at an angle of less than 180° to each other, work-retaining means adapted for conforming travel about one surface of said member from edge to edge thereof, and conveying means for receiving work from said work-retaining means after traverse of said path-forming member.

12. A work-turning machine as described in claim 3 wherein means are provided for parting said cooperating elements adjacent one end edge of said path-forming member, and means for presenting said elements in confronting, registering face-to-face relationship adjacent the other end edge of said member.

13. A work-turning machine as described in claim 3 wherein said cooperating work-engaging elements are flexible, continuous belts.

14. A work-turning machine comprising a spiral path-forming member having a work-receiving edge and a work-discharge edge, said member being contoured so as to dispose said edges in non-parallel relation to each other, work gripping elements adapted for conforming traverse about one surface of said member, means for conveying work to said member, and means for receiving work after travel about said member.

References Cited in the file of this patent

UNITED STATES PATENTS

564,163	Schaaake	July 14, 1896
1,872,402	Candee	Aug. 16, 1932