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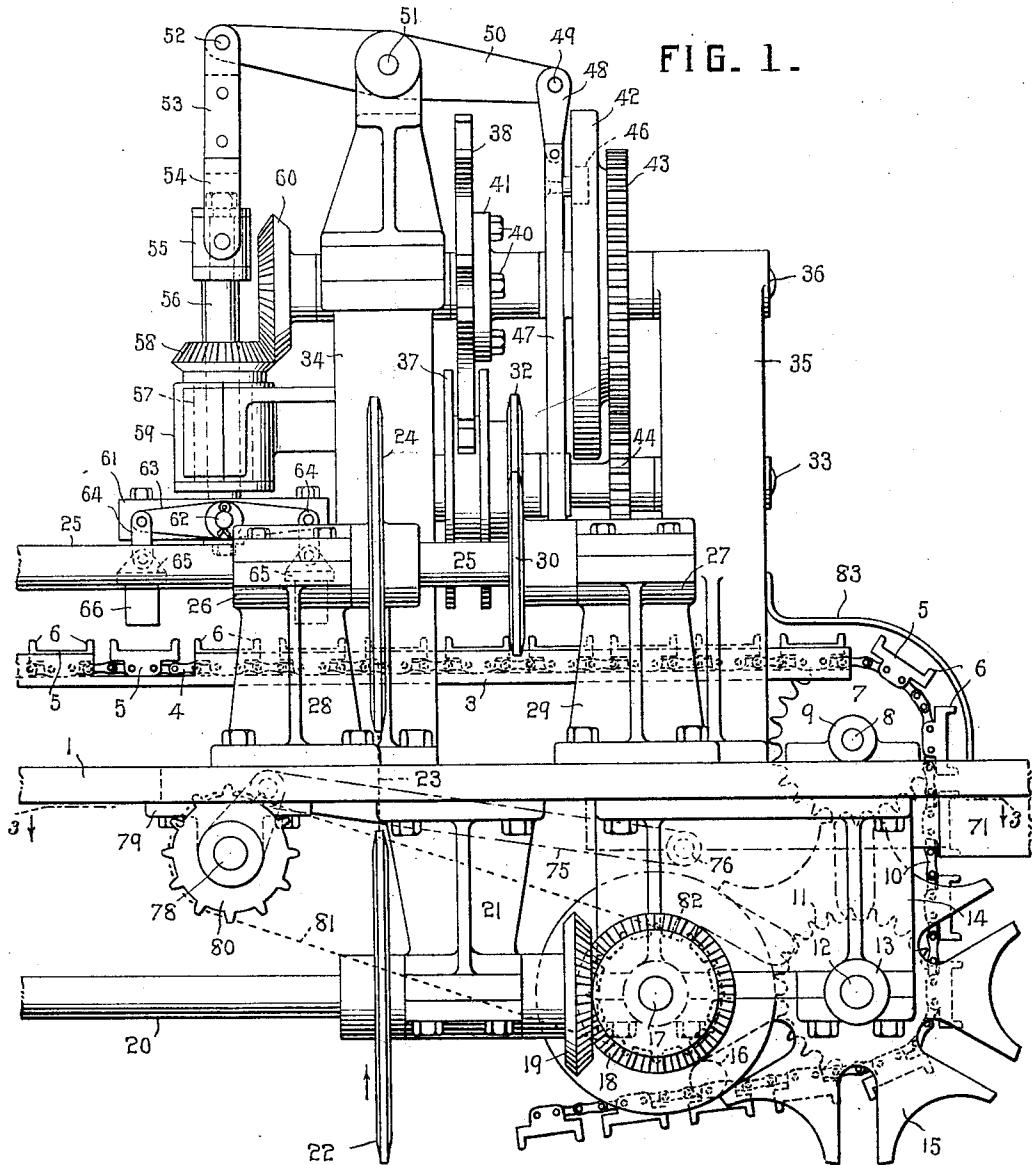
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TURNING MECHANISM FOR BOOK MATCH MACHINES

Filed March 5, 1931

6 Sheets-Sheet 1



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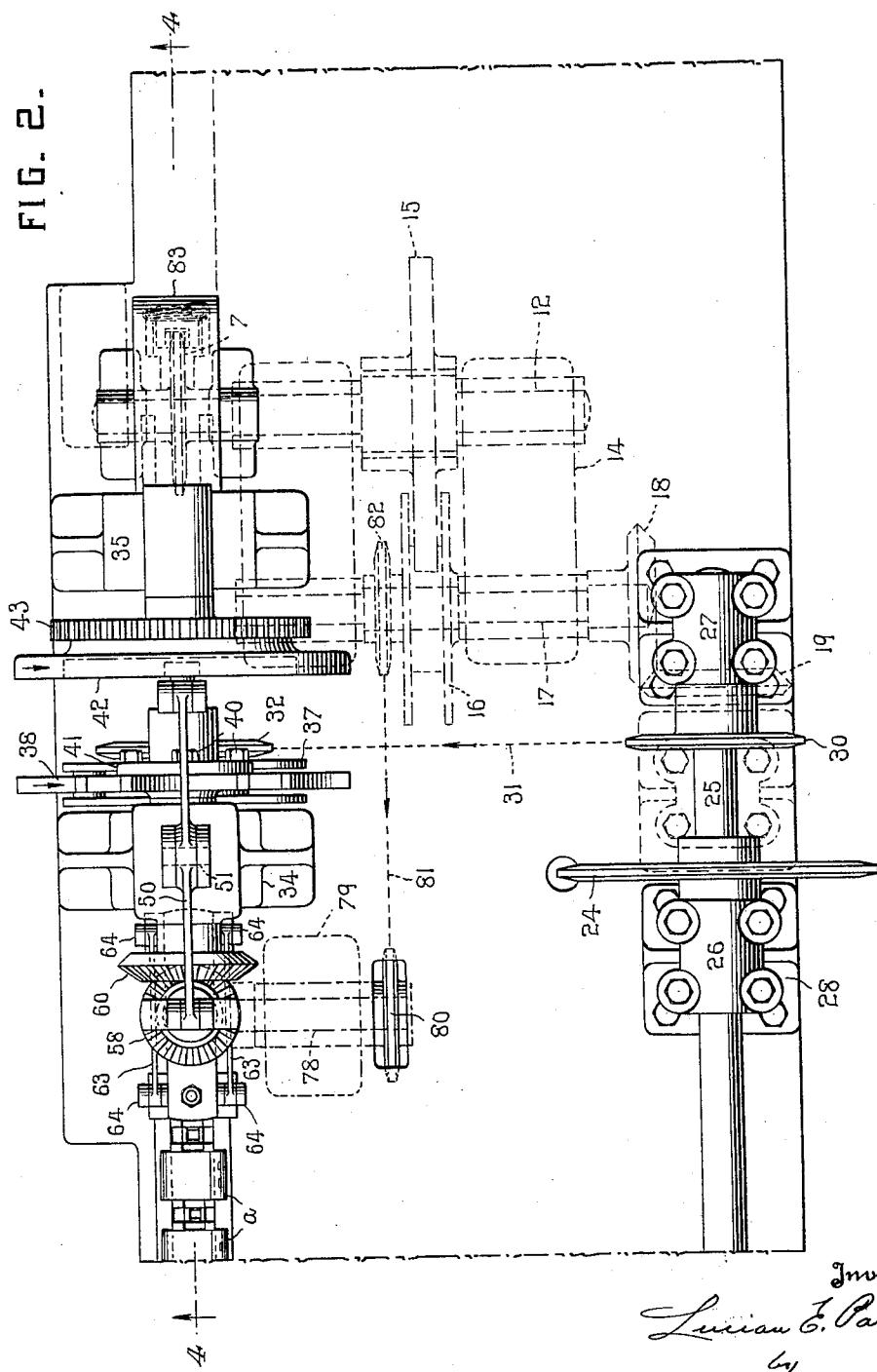
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TURNING MECHANISM FOR BOOK MATCH MACHINES

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6 Sheets-Sheet 2

FIG.



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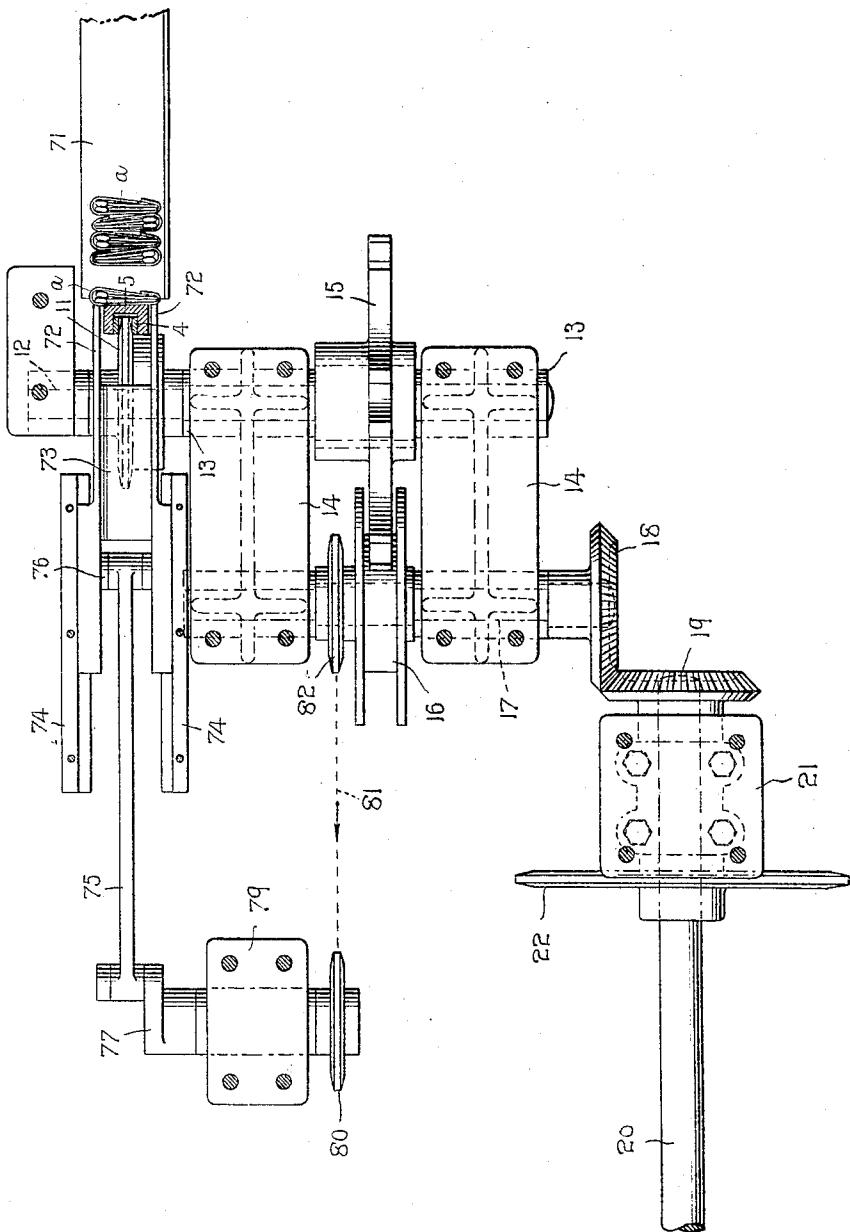
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TURNING MECHANISM FOR BOOK MATCH MACHINES

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6 Sheets-Sheet 3

FIG. 3.



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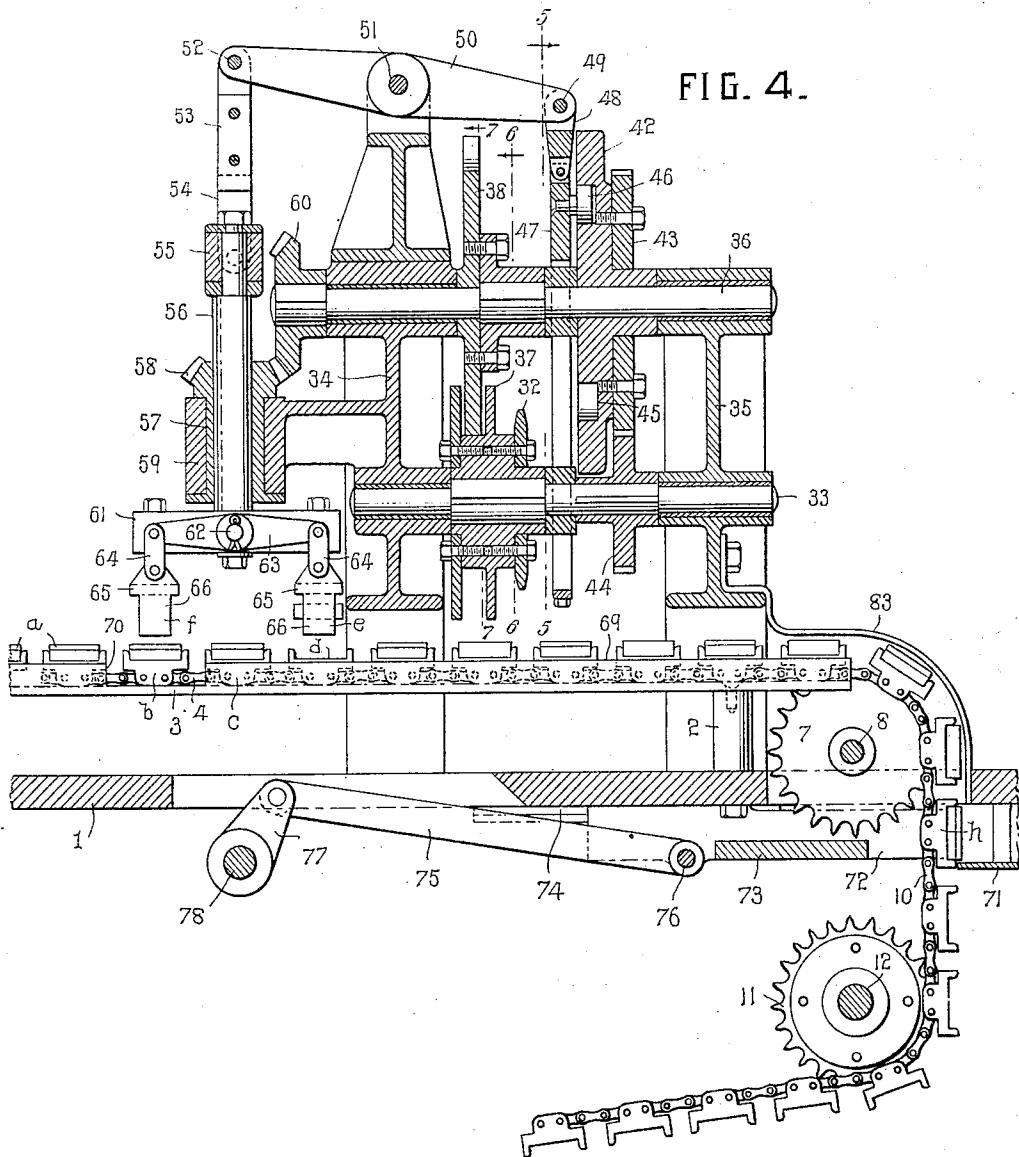
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TURNING MECHANISM FOR BOOK MATCH MACHINES

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6 Sheets-Sheet 4



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TURNING MECHANISM FOR BOOK MATCH MACHINES

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FIG. 5.

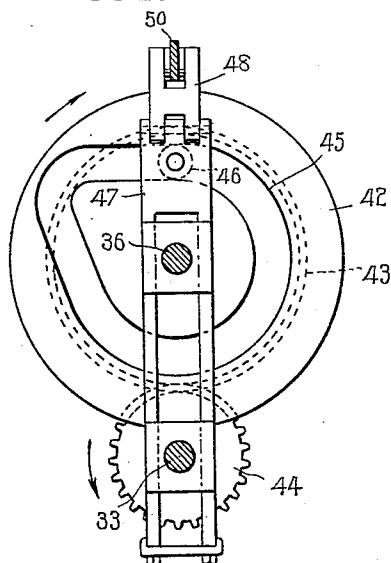


FIG. 6.

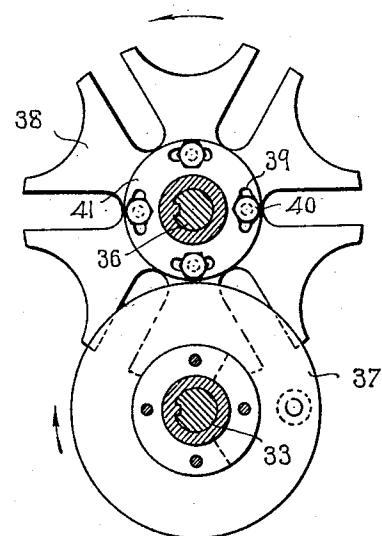


FIG. 7.

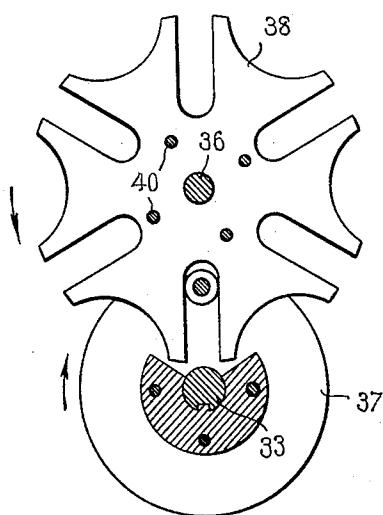
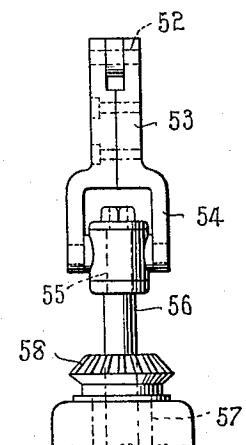


FIG. 8.



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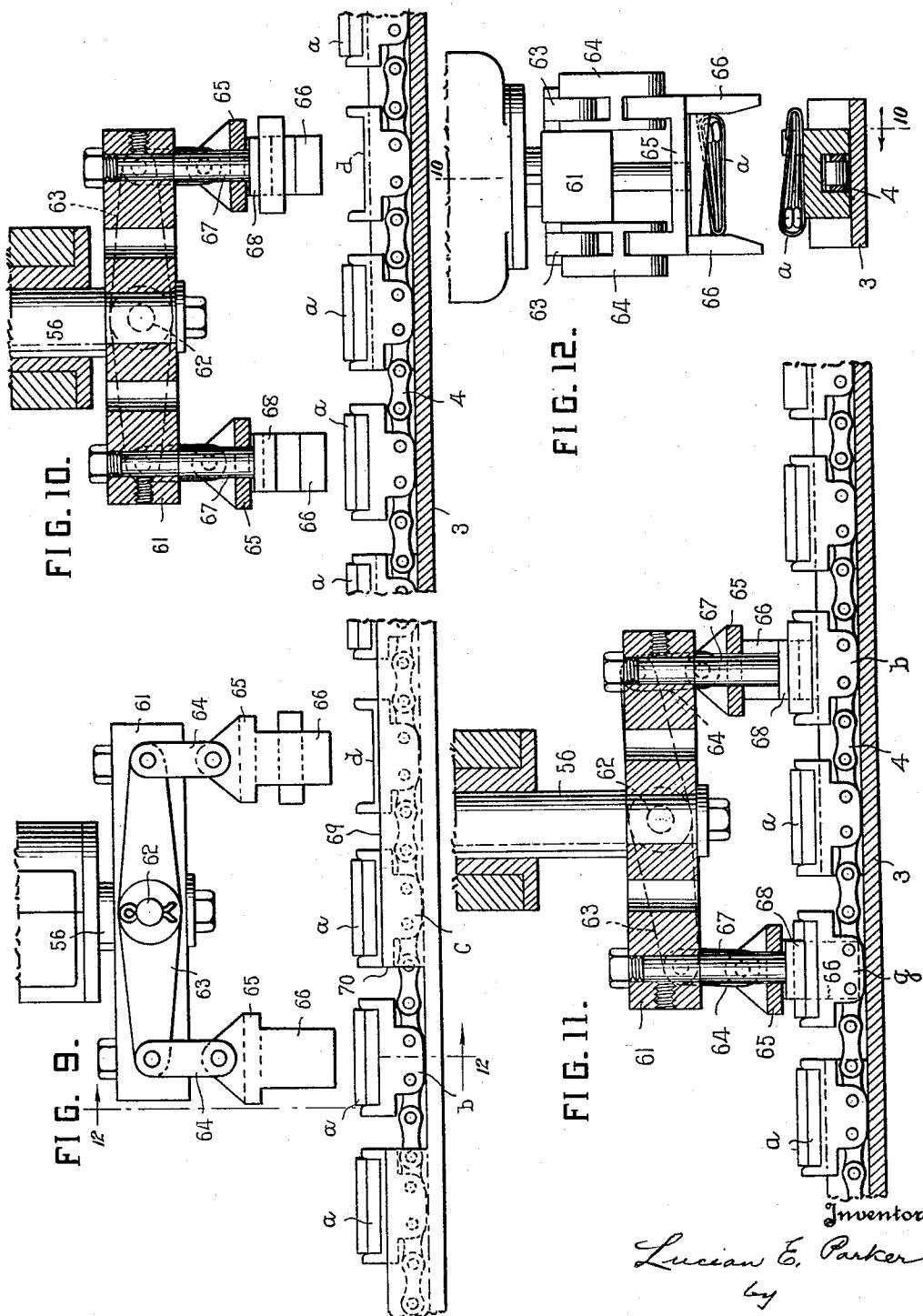
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TURNING MECHANISM FOR BOOK MATCH MACHINES

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6 Sheets-Sheet 6



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TURNING MECHANISM FOR BOOK MATCH MACHINES

Application filed March 5, 1931. Serial No. 520,454.

This invention relates to book match machines, and particularly to a mechanism whereby the match books may be suitably arranged for packing.

As is well known the match books as they come from the machine by which they are made are uniformly arranged with their "friction" ends all in the same direction. Inasmuch as the match books are thicker at the ends where the heads of the matches are located than at the ends at which the "friction" is located, it is customary, in order to provide for even stacking of the books for packing that alternate books be reversed end for end, and it is for this purpose that the mechanism forming the subject matter of this invention is designed.

One object of this invention is to provide a mechanism for turning alternate match books in a substantially continuously fed plurality of such books end for end by mechanical means which are designed to positively remove such alternate books turn them end for end and replace them thus reversed in the continuously fed plurality of books without likelihood of failure or error and for discharging the books in alternate end for end appropriate stacked arrangement for packing in the customary manner.

The invention consists in a turning mechanism for book match machines including a traveling conveyor and means for imparting a step by step longitudinal movement thereto, a mechanism associated with such conveyor and operated in timed relation to the movement thereof for picking up a match book from one point on the conveyor, turning the match book end for end, while the conveyor moves, and returning the match book to the same point on the conveyor from which it was removed but in reversed end for end position, and mechanism for ejecting the match books from the conveyor. And the invention consists further in various details of the mechanism employed, all as I will proceed to explain more fully hereinafter and finally claim.

In the accompanying drawings illustrating the invention in the several figures of which like parts are similarly designated,

Figure 1 is a fragmentary side elevation of that portion of the book match machine which embodies the mechanism forming the subject of my invention. Fig. 2 is a plan view of the parts illustrated in Fig. 1. Fig. 3 is a section taken on the line 3—3 of Fig. 1. Fig. 4 is a section taken on the line 4—4 of Fig. 2. Fig. 5 is a section taken on the line 5—5 of Fig. 4. Fig. 6 is a section on line 6—6 of Fig. 4. Fig. 7 is a section taken on line 7—7 of Fig. 4. Fig. 8 is a front elevation of the swivel and link connection between the rocker arm or walking beam and the reciprocating shaft which carries the match book engaging mechanism. Fig. 9 is an enlarged side elevation of a portion of the pick-up mechanism illustrated particularly in Figs. 1 and 4. Fig. 10 is a sectional elevation of the parts illustrated in Fig. 9. Fig. 11 is a view similar to Fig. 10 but showing the parts in a different position. Fig. 12 is a sectional elevation taken on the line 12—12 of Fig. 9.

Upon the bed 1 of the machine is mounted by means of suitable supports 2 (Fig. 4) a track 3 in which runs the conveyor chain 4 having applied to it, at suitably spaced intervals, match book carrier links 5 provided with end flanges 6 so spaced as to properly position the books by engagement with their side edges. This chain is carried by suitable sprockets 7, only one of which is shown, mounted on shafts 8 journaled in bearings 9 on the bed 1, and passes in a substantially vertical flight, indicated at 10, to a sprocket 11 mounted on a cross shaft 12 arranged in suitable bearings 13 (see Fig. 3) in frames 14 carried on the under side of the bed 1. An intermittent rotary motion is imparted to the shaft 12 and the sprocket 11 by means of a Geneva gear 15 keyed to the shaft 12 and driven by means of the Geneva drive member 16 keyed to a back shaft 17 which carries a bevel pinion 18 meshing with a complementary bevel pinion 19 keyed to the main drive shaft 20. A bracket 21 carried on the under side of the bed 1 provides a bearing for the shaft 20. By means of this drive, it will be seen that an intermittent step by step traveling movement is imparted to the conveyor

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chain 4 and the carrier links 5 forming a part thereof.

The main drive shaft 20 carries a sprocket 22 connected by means of a chain, indicated 5 at 23, with a sprocket 24 of the same size keyed to a shaft 25 mounted in bearings 26 and 27 of stands 28 and 29 fixed upon the bed 1. By means of this drive, continuous rotary motion is imparted to the shaft 25 by the shaft 10 20 at the same speed as that of the shaft 20. The shaft 25 has keyed to it also a sprocket 30 connected by means of a chain, indicated at 15 31, Fig. 2, to a similar sized sprocket 32 on a shaft 33 mounted in bearing stands 34 and 35 20 attached to the bed 1. Also mounted in these stands 34 and 35 is a shaft 36. Step by step rotary motion is imparted to the shaft 36 from the shaft 33 by means of a Geneva gear 37, 38, the parts of which are keyed to the 25 shafts 33 and 36, respectively, and proper timing of the shaft 36 relatively to the shaft 33 may be obtained by means of a slot and cap screw connection 39, 40, between the hub plate 41 of the Geneva gear member 38 and the member 38 itself.

Mounted for free rotation upon the shaft 36 is a cam disc 42 carrying a gear 43 which meshes with a pinion 44 keyed to the shaft 33. Thus the gear 43 and the cam 42 may be 30 driven from the shaft 33. Cooperating with the cam groove 45 of cam disc 42 is a follower roller 46 carried by a slide bearing member 47 to which is connected a link 48 pivoted at 49 to one end of a rock arm or walking beam 50 trunnioned at 51 on the stand 34. The other end of this rock lever or walking beam 50 carries at 52 a link 53 provided with a yoke portion 54 by means of which it is connected with a swivel-bearing member 55 mounted 40 upon the upper end of a rotatable reciprocable shaft 56 slidably passing through and keyed to the hub 57 of a bevel pinion 58 journaled in a bearing 59 of the stand 34. Intermittent rotary motion is imparted to the bevel 45 pinion 58 and hence to the shaft 56 by means of a bevel gear 60 keyed to the end of the shaft 36, and thus, due to the ratio between the gear 43 and pinion 44, and the Geneva gear 37, 38, the shaft 56 will be reciprocated once 50 to each 180 degrees partial rotation made by it, and its rotation will be performed in intermittent movements as determined by the Geneva gear 37, 38.

Fixed upon the lower end of the shaft 56 is 55 a head 61 provided upon its opposite sides with trunnions 62 upon which are pivoted rocker arms 63 connected by links 64 with pick-up members 65 having fingers 66 (see particularly Fig. 12) so spaced as to frictionally grasp the match books at their opposite ends. Mounted on studs 67 (see Figs. 10 and 11) passing through the pick-up members 65 and secured in the head 61, as shown, are ejector members 68 which operate as herein- 60 after explained to eject the match books from

the pickup members in a predetermined manner.

The track 3 has side rails 69 which cooperate with the fingers 66 and these rails are cut away at 70 for a purpose hereinafter explained.

Adjacent to the vertical flight portion 10 of the conveyor chain 4 is a discharge chute 71, (see Figs. 1, 3 and 4) and into this chute the match books are ejected from the carrier links of the conveyor chain by means of push fingers 72 carried by a slide 73 mounted in guides 74 attached to the underface of the bed 1. This slide 73 and the push fingers 72 carried thereby are reciprocated in timed relation to the travel of the conveyor chain 4 by means of a link 75 connected at one end 76 to the slide 73 and at its other end with a crank 77 rotated by a shaft 78 mounted in a bearing bracket 79 attached to the bed 1. This shaft 78 carries a sprocket 80 connected by means of a chain, indicated at 81, (Figs. 1, 2 and 3) with a sprocket 82 rotatable with the back shaft 17.

In order that the match books may not 90 become dislodged accidentally from the conveyor chain as they pass around the sprocket 7 a guard 83 is provided, as shown in Figs. 1, 2 and 4.

The finished books of matches coming from 95 the book match machine proper are deposited in uniform arrangement in linear series in the carrier links 5 of the conveyor chain 4, with their small ends (the ends bearing the "friction") all in one direction and their similar faces (preferably the tuck-in flap or "friction" faces) up, as indicated at *a* in Figs. 2 and 4, and 9 to 11, inclusive. The chain with its carrier links is advanced, as previously 100 described, with an intermittent or step by step movement along the track 3 between the side rails 69 thereof, the intermittent advance of the chain being in steps equal to the distance between two carrier links. In other words, during one movement of the chain a carrier link will advance from the position *b* to the position *c* (Fig. 4).

Now assuming, as would be the case when 105 the machine is first started in operation, that there is no book of matches in the carrier link *d*, Figs. 4, 9 and 10, and assuming also that the Geneva drive 37, 38 and the bevel gears 58 and 60 provide a ratio such that two full turns of the Geneva drive will 110 rotate the shaft 56 together with the head 61 and the parts mounted thereon one-half revolution, consisting of two partial rotations of 90 degrees each, it will be apparent that due to the two to one ratio of the gear 43 and pinion 44 while the shaft 56 is making one-half turn the cam 42 will be operated once to reciprocate the shaft 56 and depress and raise the head 61 and the parts carried thereby.

This being the case, when the head 61 is 115

depressed the fingers 66 of the pick-up member *e* will strike against the rails 69 of the track 3, and as the head continues its descent this will cause the fingers 66 of the pick-up member *f*, due to the pivotal action of the rocker arms 63, to move so far down, as illustrated in Fig. 11 as to frictionally grasp the ends of the match book contained in the carrier link *b*, this additional downward movement being accommodated by the cut-away portion 70 of the rails 69 at this point. When the shaft 56 again rises, the rocker arms and the pick-up members carried thereby will remain in the same relative positions, and the pick-up member *f* will remove the match book from the carrier link *b* and hold it between its fingers 66 while the shaft 56 makes its two step partial rotation until the pick-up member *f* occupies the position formerly occupied by the pick-up member *e*, the carrier chain 4 meanwhile having advanced in two steps to the point where the link *b* which is now empty occupies the position formerly occupied by the link *d*. Upon the next descent of the head 61 the pick-up member *f* which now carries a match book, as shown in the pick-up member *e*, will descend until its fingers 66 strike against the tops of the rails 69 and the rocker arms 63 will be rotated to the position illustrated in Fig. 11, thus causing the ejector member 68 of this pick-up member to eject the match book from between the fingers 66 and into the carrier link *b* which has moved to the position shown in Fig. 11, as described, and at the same time the other pick-up member will have descended in the manner previously explained to pick-up the book of matches from the carrier link *g*.

Thus, at each reciprocation of the shaft 56 and head 61, the pick-up members will remove a match book from one carrier link of the conveyor chain and deposit another book reversed end for end in another carrier link of the chain, and as the conveyor chain progresses along the track 3 each carrier link thereof will contain a book of matches, but alternate books will be reversed end for end thereof as indicated in Fig. 4.

When the carrier links reach the position indicated at *h*, Fig. 4, the push fingers 72 will be operated to push the books out of the carrier links and into the chute 71, from which chute they are taken by hand and placed in boxes.

It will of course be understood that during the time in which the head 61 is depressed and raised by the action of the cam 42, the shaft 56 will be held against rotation by the Geneva gear, and this shaft 56 will be rotated only during the periods when the head 61 and its parts are raised out of the way of the carrier links of the conveyor chain.

All of the elements of the mechanism being driven from the main drive shaft 20, it

will be apparent that their operations may be properly relatively timed so that all may cooperatively function to produce the desired result.

Various changes are contemplated as within the spirit of the invention and the scope of the following claims.

What I claim is:—

1. A turning mechanism for book match machines from which machines the books of matches are discharged in a uniform linear series and in similar endwise and face arrangement, including means for removing alternate books from said linear series, reversing them end for end, and returning them to their original positions in said linear series thus reversed and in the same face arrangement. 75

2. A turning mechanism for book match machines from which machines the books of matches are discharged in a uniform linear series and in similar endwise and face arrangement, including means for advancing said books step by step, and means for removing alternate books from said linear series, reversing them end for end, and returning them to their original positions in said linear series thus reversed and in the same face arrangement, the operations of removing said match books from said series and returning them thereto being performed during periods of rest in the step by step advance of the books. 85

3. In a turning mechanism for book match machines, the combination with a travelling conveyor adapted to receive match books in predetermined spaced relation and in similar endwise and face arrangement thereon, of means for turning alternate match books end for end, including mechanism adapted to engage alternate match books, remove them from said conveyor, reverse them end for end, and return them to said conveyor at approximately the same positions from which they were removed and in the same face arrangement. 95

4. In a turning mechanism for book match machines, the combination with a travelling conveyor adapted to receive match books in predetermined spaced relation and in similar endwise and face arrangement thereon, of means for turning alternate match books end for end, including mechanism adapted to engage alternate match books, raise them from said conveyor, reverse them end for end, and lower and discharge them onto said conveyor at approximately the same positions from which they were removed and in the same face arrangement. 100

5. In a turning mechanism for book match machines, the combination with a travelling conveyor provided with a plurality of carrier links adapted to receive a series of match books in predetermined spaced relation and in similar endwise and face arrangement. 115

thereon, of means for turning alternate match books of said series end for end, including a pick-up device adapted to engage alternate match books, remove them from the carrier 5 links, reverse them end for end, and return them thus reversed and in the same face arrangement to appropriate unoccupied carrier links.

6. In a turning mechanism for book match 10 machines, the combination with a travelling conveyor provided with a plurality of carrier links adapted to receive a series of match books in predetermined spaced relation and in similar endwise arrangement thereon, of 15 means for turning alternate match books of said series end for end, including a pair of similar pick-up devices adapted to engage alternate match books, elevate and remove them from the carrier links, reverse them 20 end for end, and lower and return them thus reversed to appropriate unoccupied carrier links.

7. In a turning mechanism for book match 25 machines, the combination with a travelling conveyor provided with a plurality of carrier links adapted to receive a series of match books in predetermined spaced relation and in similar endwise arrangement thereon, of 30 means for turning alternate match books of said series end for end, including a pair of similar pick-up devices adapted to engage alternate match books, elevate and remove them from the carrier links, reverse them end for end, and lower and return them to 35 the same carrier links from which they were removed in such reversed relationship.

8. In a turning mechanism for book match 40 machines, the combination with a travelling conveyor provided with a plurality of carrier links adapted to receive a series of match books in predetermined spaced relation and in similar endwise arrangement thereon, of 45 means for turning alternate match books of said series end for end, including a pair of similar pick-up devices adapted to engage alternate match books, remove them from the carrier links, reverse them end for end, and return them to the same carrier links from 50 which they were removed in such reversed relationship, said pick-up devices provided with means for automatically ejecting the match books therefrom.

9. In a turning mechanism for book match 55 machines, the combination with a travelling conveyor adapted to receive a series of match books in predetermined spaced relation and in similar endwise arrangement thereon, of 60 means for turning alternate match books of said series end for end, including a reciprocable shaft carrying a pair of pick-up devices adapted to alternately remove alternate match books from said conveyor, means for 65 rotating said shaft to thereby reverse said match books end for end, said pick-up devices being operable after said reversing

movement to return said match books to said conveyor at approximately the same positions from which they were removed.

10. In a turning mechanism for book match 70 machines, the combination with a travelling conveyor adapted to receive a series of match books in predetermined spaced relation and in similar endwise arrangement thereon, of means for turning alternate match books of said series end for end, including a reciprocable rotatable shaft, a head mounted on said shaft, a pair of pick-up devices carried by said head and oscillatable relatively thereto, said pick-up devices adapted upon reciprocation of said shaft to alternately remove from and return to said conveyor alternate match books, the oscillation of said pick-up members enabling them to grasp said books, and means for imparting reciprocation and rotation to said shaft in time relation to the travel of said conveyor.

11. In a turning mechanism for book match 75 machines, the combination with a travelling conveyor provided with a plurality of carrier links adapted to receive a series of match books in predetermined spaced relation and in similar endwise arrangement thereon, of means for turning alternate match books of said series end for end, including a reciprocable rotatable member provided with pick-up devices adapted to simultaneously remove from and replace in alternate links of said conveyor alternate match books of said series, the rotation of said member serving to reverse the endwise arrangement 80 of the book removed, and means for imparting travelling movement to said conveyor and reciprocating and rotating movement to said member in timed relation to each other.

12. In a turning mechanism for book match 85 machines, the combination with a track and a conveyor travelling therein and adapted to receive a series of match books in predetermined spaced relation and in similar endwise arrangement thereon, of means for turning alternate match books of said series end for end, including a reciprocable rotatable shaft, a head mounted on said shaft, a pair of pick-up devices carried by said head and oscillatable relatively thereto, said pick-up devices adapted upon reciprocation of said shaft to alternately remove from and return to said conveyor alternate match books, the oscillation of said pick-up members being imparted during descent of said head by arrest of movement of one of said pick-up devices, thus enabling the other pick-up member to descend into grasping engagement with a book of matches to be removed from said conveyor, and means for imparting reciprocation and rotation to said shaft in timed relation to the travel of said conveyor.

13. In a turning mechanism for book match 90 machines, the combination with a travelling conveyor provided with a plu- 95

rality of carrier links adapted to receive a series of match books in predetermined spaced relation and in similar endwise arrangement thereon, of means for turning alternate match books of said series end for end during the travelling movement of said conveyor whereby, after such operation, the series of books is arranged in the links of said conveyor with successive books in reverse endwise arrangement, means into which said books may be discharged in such arrangement and evenly stacked, and means operated in timed relation to the travel of said conveyor for successively ejecting books from the links of said conveyor into said discharge means.

14. In a turning mechanism for book match machines, the combination with a conveyor provided with a plurality of match book receiving links, of means for imparting a step by step travelling movement to said conveyor, a vertically reciprocable rotatable shaft arranged above said conveyor and provided at its lower end with a head, rocker arms carried at opposite sides of said head, a pair of pick-up devices carried at the ends of said rocker arms, said pick-up devices having fingers adapted to grasp match books carried by said carrier links, ejector members arranged between said fingers and rigidly mounted in said head, said fingers being movable relatively to said ejector members in response to oscillation of said rocker arms to discharge match books from between said fingers, a track on which said conveyor travels and with which one of said pick-up devices may contact to impart oscillation to said rocker arms, independent means for imparting reciprocation and rotation to said shaft, and means for driving said conveyor moving means and said reciprocation and rotation imparting means in timed relation to each other.

15. In a turning mechanism for book match machines, the combination with a conveyor provided with a plurality of match book receiving links, of means for imparting a step by step travelling movement to said conveyor, a vertically reciprocable rotatable shaft arranged above said conveyor and provided at its lower end with a head, rocker arms carried at opposite sides of said head, a pair of pick-up devices carried at the ends of said rocker arms, said pick-up devices having fingers adapted to grasp match books carried by said carrier links, ejector members arranged between said fingers and rigidly mounted in said head, said fingers being movable relatively to said ejector members in response to oscillation of said rocker arms to discharge match books from between said fingers, a track on which said conveyor travels and with which one of said pick-up devices may contact to impart oscillation to said rocker arms, independent means for im-

parting reciprocation and rotation to said shaft including a cam and lever mechanism and Geneva gearing respectively, and means for driving said conveyor moving means and said reciprocation and rotation imparting means in timed relation to each other.

In testimony whereof I have hereunto set my hand this 2nd day of March, A. D. 1931.

LUCIAN E. PARKER.

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