

Dec. 26, 1944.

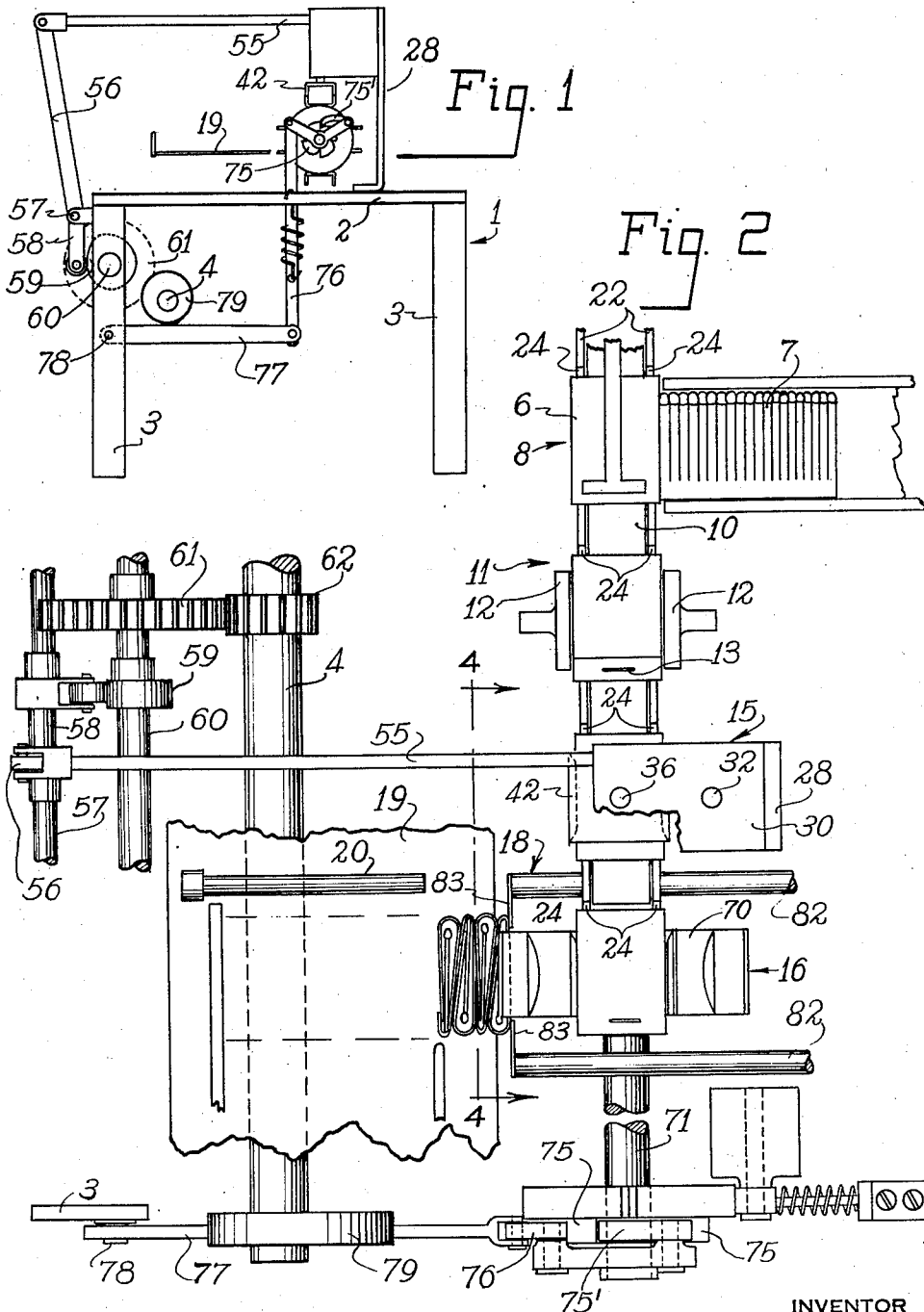
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2,365,733

MATCH BOOK ASSEMBLING MECHANISM

Filed Feb. 28, 1941

3 Sheets-Sheet 1



INVENTOR

Morris Spector

Dec. 26, 1944.

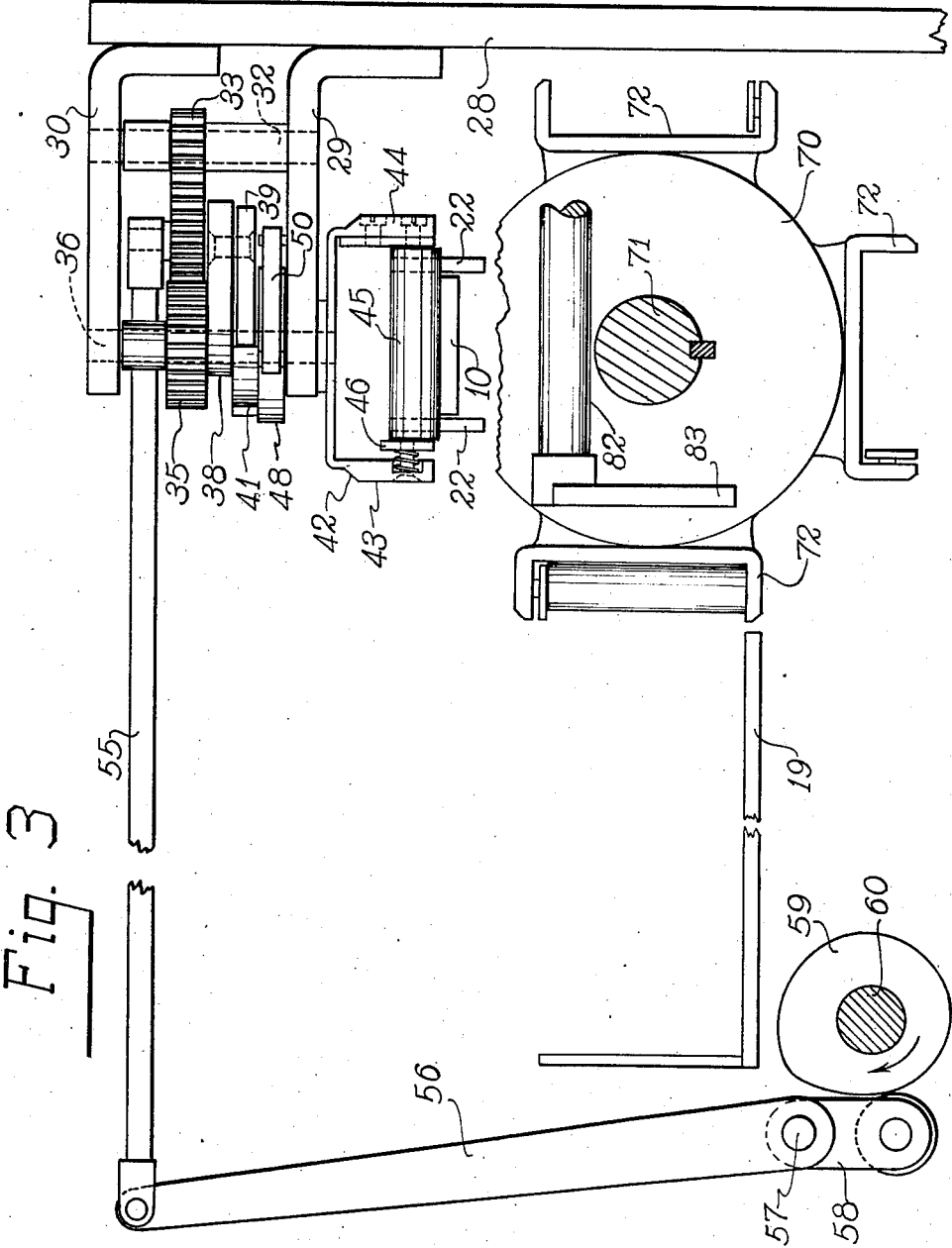
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Fig. 5

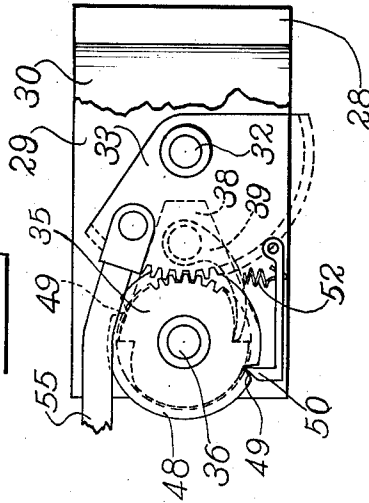
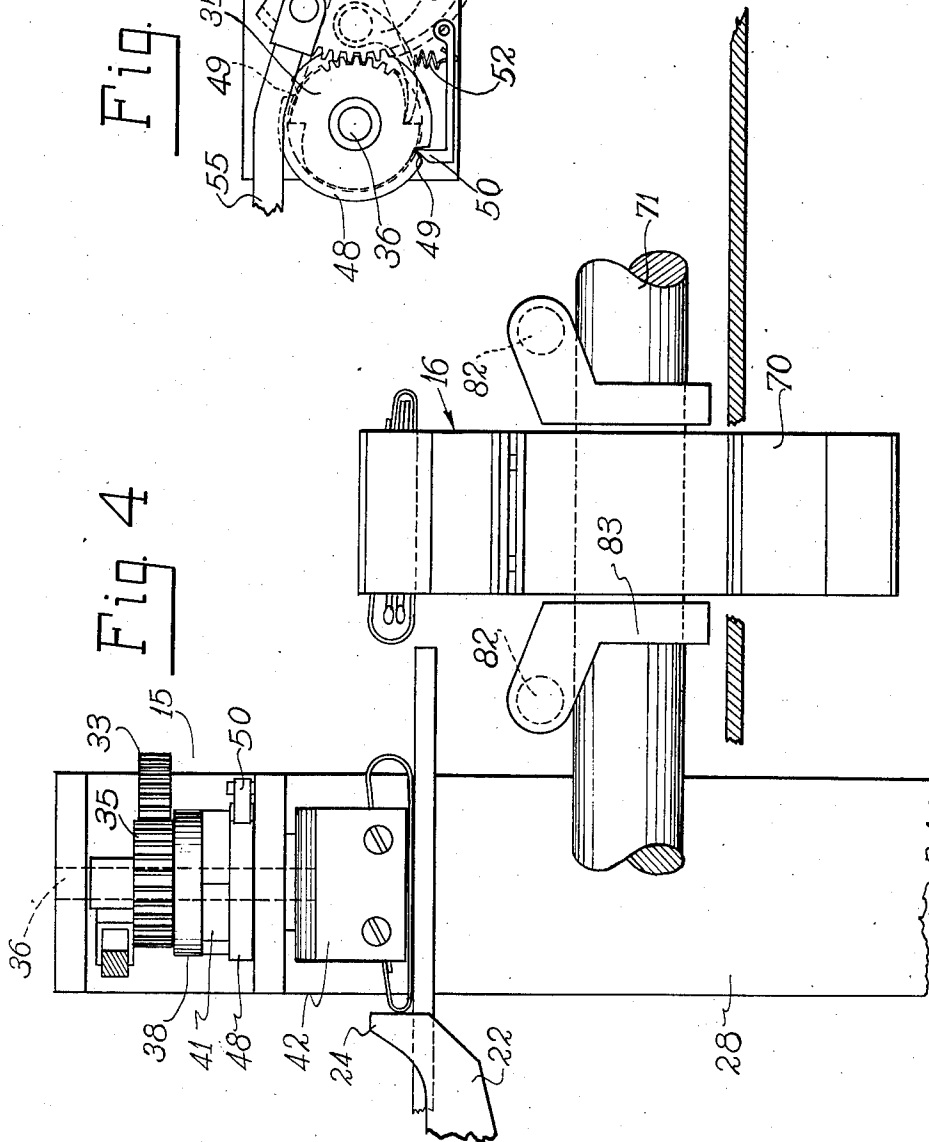


Fig. 4



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UNITED STATES PATENT OFFICE

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MATCH BOOK ASSEMBLING MECHANISM

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11 Claims. (Cl. 226—4)

This invention relates to assembling mechanism for match book making machines.

It is one of the objects of the present invention to provide an improved mechanism for assembling match books. As commonly constructed, owing to the heads of the matches being positioned at one end of the books, the match books are thinner at one end than at the other and it is therefore necessary that the match books be alternated preparatory to packing, that is, the thicker end of one book be positioned between the thinner ends of the adjacent books on opposite sides thereof.

When match books are delivered by a match book making machine they travel in a straight line, one behind the other, with the thin ends of all the books facing in the same direction. It has been proposed to reverse alternate books by a transfer mechanism which transfers the books from the match making portion of the machine to the stacking portion thereof, said transfer mechanism being arranged to reverse alternate books. The transfer mechanism comprises a rotatable polygonal shaped frame having a number of receivers or pockets on the periphery thereof each of which receives a match book and transfers it to the stacking mechanism. In one form of mechanism, such as shown in the patent to Nevins, No. 1,535,031, the alternate receivers are rotatable so that alternate match books are reversed as they are moved from the assembling line to the stacking mechanism. Such an arrangement is quite satisfactory in a medium or low speed machine. However, if the machine is to be operated at a very high speed then alternate match books which are being reversed as well as moved towards the assembling mechanism must be moved at a terrifically high velocity. This is objectionable. In addition, the means for reversing alternate pockets must necessarily be located within the polygonal frame. This necessitates a comparatively large frame and, at the same time, imposes the condition that the gearing be very small and therefore cut with a high degree of precision. Any wear on the gears will produce play or back lash which is highly objectionable.

It is one of the objects of the present invention to provide a reversing mechanism in addition to the transfer mechanism thus relieving the transfer mechanism of the duty of reversing alternate books and therefore permitting a higher speed of operation. Since the reversing mechanism is apart from the transfer mechanism it also may have a high speed of operation. While one match book is being transferred to the stacking

mechanism the next succeeding book is in the process of reversal. Furthermore, since the reversing mechanism is apart from the transfer mechanism the actuating gearing for the reversing mechanism need not be made as small as in the case where the reversing mechanism is combined with the transfer mechanism. Larger gearing eliminates the need of extreme precautions as to precision and therefore avoids a large amount of play developing after a small amount of wear of the bearings or teeth.

The books are delivered by the match book making machine in a step by step manner, there being a period of dwell between each successive movement of the match book. The step by step movement of the match book is necessitated because each book is advanced successively to the different operating mechanisms for forming the book, with a period of dwell at each operating mechanism. In accordance with the principles of the present invention a turn table is positioned to receive each successively completed match book from the match book making machine. The turn table is interposed between the match book making machine and the transfer frame or turret which transfers the books to a stacking mechanism. The turn table is arranged to rotate through 180° for each alternate book received thereby, during the period of dwell between successive movements of the book. On the intervening alternate books received by the turn table the turn table remains stationary. Thus the turn table reverses the position of alternate books. Any desired means may be provided for rotating the turn table through its 180°. One suitable means is by a cam arrangement driven by the main shaft of the match book making machine so that the rotation of the reversing table is always in proper phase relationship to the movement of the match books delivered by the match book making machine. If desired, an electromagnet may be provided for turning the turn table 180° for each energization of the magnet. The magnet can be energized in proper time relationship to the movement of the match books by a switch controlled by a cam driven by the main shaft of the match book making machine. In any event, regardless of the specific mechanism used for turning the turn table or match book making mechanism, the arrangement is such that only alternate books are turned. If desired successive rotations of the turn table may be in the same direction or, as an alternative, successive 180° turns of the turn table may be in opposite directions so that the turn table merely oscillates

through a 180° arc, the arrangement being such that successive oscillations of the turntable shall take place when alternate books are in the turn table, the turn table being stationary during the entire intervals when the intervening alternate books are in the turn table.

The attainment of the above and further objects of the present invention will be apparent from the following specification taken in conjunction with the accompanying drawings forming a part thereof.

In the drawings:

Figure 1 is a front view of a machine embodying the present invention, certain parts of the machine which are not a part of the present invention being omitted;

Figure 2 is a fragmentary plan view of a part of the machine of Figure 1;

Figure 3 is an enlarged front view of a portion of the machine, with certain parts thereof omitted;

Figure 4 is an enlarged fragmentary sectional view taken along the line 4—4 of Figure 2; and
Figure 5 is an enlarged plan view of a portion of the reversing mechanism, with certain of the parts broken away.

Reference may now be had more particularly to Figures 1 and 2. The mechanism of the present invention is applied to a standard type of match book making machine, indicated at 1. The machine may be of any preferred construction, and manufactures match books of a well known type, such as, for instance, are manufactured by the machine of the patent to Paridon, et al., No. 1,042,472, although the match book making machine of Figure 1 is specifically a different type of machine. The machine includes a rectangular table top 2 supported by four legs 3. A motor driven main drive shaft 4 is journaled on the under side of the table top 2 and has keyed thereto various cams for operating the match book making machine which form no part of the present invention. It is sufficient to say that the match book covers 6 and match splints 7 are assembled together at a station indicated at 8 and then slid along a flat slide 10 to a stapling position 11, where the match splints are centered between the ends of the cover by centering arms 12—12, and a wire staple 13 is inserted to staple the match splints to the cover. This completes the match book. The match book is then slid forward along the slide 10 to a reversing position in a reversing mechanism 15. All of the books leaving the stapling position 11 are in alignment with one another with the stapled end, that is, the thin end of the book, foremost. The reversing mechanism reverses alternate books so that on the books reversed the stapled end is rearward of the machine rather than forwardly of the machine. The books are then slid forward to a transfer mechanism 16 from which they are transferred by a stacking mechanism 18 which stacks them on a delivery table 19. When a row of twenty-five books, or any other suitable number of books, has been delivered to the table 19 a pusher 20 pushes the row of books forward, thus making room for the next row of twenty-five books, as is well known in the art.

The match books in the process of formation, and also after completion, are advanced on the slide 10 by a pair of pusher bars 22 that embrace the slide 10 and each of which has a plurality of upwardly extending fingers 24 a distance apart equal to the length of the stroke of the pusher bars. The pusher bars are illustrated in Figure 2

in their foremost position. In the operation of the machine the fingers 24 move downwardly below the top of the slide 10 and then back for the full length of the stroke, then up again and forward to the position illustrated in Figures 2 and 4. This completes one cycle of travel of the pusher bars, each cycle resulting in the advancement of a set of three match books to the next succeeding position. The pusher bars are actuated by a cam mechanism, not shown, driven from the main shaft 4.

A description will now be given of the construction of the reversing mechanism 15 for reversing alternate match books. The reversing mechanism is supported on a standard 28 rigidly mounted on the table top 2. A pair of ledges or brackets 29—30 are welded or otherwise secured to the standard 28. A stud shaft 32 is journaled between the brackets 29—30 and carries a gear sector 33 rotatable about the axis of the stud shaft 32. The teeth of the sector 33 are in mesh with a gear wheel 35 that is loose on a stud shaft 36 and which is of a radius half the radius of the gear sector 33. The lower surface of the gear wheel 35 has an arm 38 secured thereto and which rotates with the gear wheel 35. The arm 38 has a pawl 39 pivotally secured thereto, which pawl engages a ratchet 41 keyed to the stud shaft 36. The ratchet has two teeth thereon. The ratchet 41 rotates the shaft 36 which carries, at its lower end, a match book receiver or turn table 42. The receiver 42 is rotated with the stud shaft 36. The receiver 42 includes a pair of arms 43—44 adapted to embrace a match book 45 and hold the same lightly as by a small plate 46 which is pressed toward the match book by a very light spring. The match book is thus held lightly in the receiver 42, even though there may be slight differences in the widths of successive match books delivered. The axis of the stud shaft 36 is at right angles to the slide 10 and passes exactly through the center of the match book 45 in the receiver 42. The reversing mechanism is rotatable to rotate the receiver 42 through an angle exactly 180°. Means is provided for centering the receiver 42 in its two alternate positions to make up for any slight wear on the parts. This means comprises a disc 48 having two grooves 49 in the periphery thereof exactly 180° apart, which receive a centering pawl 50 that has a rounded nose adapted to enter the groove 49 and force the disc 48 to its proper centering position under the action of a spring 52.

The gear sector 33 is oscillated to and fro through an angle of 90° by a link 55 that is reciprocated longitudinally by a lever 56 keyed to a pivoted shaft 57 that is oscillated by a crank 58 keyed thereto and which carries a roller at its lower end that rides on a cam 59 keyed on a stud shaft 60 driven by the main shaft 4 at exactly half the speed of the main shaft 4 through a set of gears 61—62. The shaft 57 is moved in one direction by the cam and in the reverse direction by a spring (not shown). The shaft 4 makes one complete revolution for each book delivered by the match book making machine 1. With each revolution of the shaft 60, that is, for every two revolutions of the shaft 4, the shaft 57 oscillates back and forth once, thus advancing the link 55 and the gear sector once and then returning it to the position illustrated in Figure 5. As the link 55 moves to the right from the position illustrated in Figures 2 and 5, it rotates the gear sector 33 clockwise and rotates the gear wheel 35 counter-clockwise. The cam 59 and the levers

55 and 56 are so proportioned that the stroke of the gear sector 33 is an amount just sufficient to rotate the gear wheel 35 through an angle of 180°. During that time the arm 38 and pawl 39 rotate through an angle of 180°, the pawl rides upon the ratchet wheel 41 and produces no motion at the ratchet. Upon the reverse movement of the link 55, that is, upon its movement to the left, from its extreme right hand position to the position illustrated in Figure 5, the pawl 39 engages the ratchet wheel 41 and moves that wheel through an angle exactly 180°.

When the shaft 57 oscillates in one direction it moves the lever 55 and through it the pawl 39 in one direction. Upon reverse oscillatory movement of the shaft 57 the pawl 39 is moved in the reverse direction. The cam 59, which, through the crank 58, oscillates the shaft 57, is arranged so that the oscillation thereof in one direction is produced during approximately 75° of circular motion of the cam 59. During the next 285° rotation of the cam 59 the shaft 57 is oscillated in the reverse direction. It is obvious, therefore, that during somewhat less than one-fourth of each revolution of the cam 59 the gear wheel 35 is rotated in one direction and during the remainder of the 360° of rotation of the cam 59 the gear wheel 35 is rotated in the opposite direction. Only one direction of rotation of the gear wheel is used to turn the match book receiver 42. The driving motion of the receiver 42 is during the 75° rotation of the cam 59. It is thus apparent that the receiver is rotated through 180° during approximately 150° turn of the main shaft 4 and that the receiver 42 remains stationary during the remaining turn of the shaft 4 and during all of the next succeeding revolution of the shaft 4. Thus, for one cycle of movement of a match book the receiver remains entirely stationary and for the next cycle of movement of a match book the receiver rotates through an angle of 180° during less than half of the cycle of rotation of the shaft 4 and remains stationary during the rest of the cycle. Thus there is a substantial period of dwell of the receiver during each revolution of the shaft 4. This period of dwell allows sufficient time for pushing a book out of the receiver and advancing a succeeding book into it. Thus alternate match books are reversed on the slide 10 while resting on the slide. During the counter-clockwise turning of the gear wheel 35, that is, when the pawl 39 is being retracted from the ratchet 41 without turning it, the spring pressed pawl 50 holds the disc 48 stationary, thus preventing movement of the receiver 42.

The successive match books are pushed from the reversing mechanism to the transfer mechanism 16. The transfer mechanism 16 comprises a frame 70 keyed to a rotatable shaft 71 and having four identical uniformly spaced match book holders 72 similar to the receiver 42, on the periphery of the frame 70. The frame is driven from the main shaft 4 through an angle of 90° for every revolution of the main shaft 4. This is accomplished by a pawl and ratchet drive. The ratchet is indicated at 75 and is keyed to the shaft 71 and has four ratchet teeth uniformly spaced thereon. The ratchet teeth are engaged by a pawl 75' on a crank which is loose on the shaft 71 and is oscillated by a pawl rod 76 which is moved up and down by a lever 77 pivoted to one of the legs 3 at 78 and actuated by a cam 79 on the shaft 4. A spring moves the pawl rod 76 in the reverse direction. During each revolution of the cam 79 the shaft 71 is moved through

one-quarter revolution with a period of dwell between successive turnings of the shaft 71. The period of dwell exceeds half of the period of one revolution of the shaft 4. The match book holders 72 thus transfer the successive match books from the level of the slide 10 through 90° to the level of a stacking table 19.

A stacking mechanism is provided for discharging successive books from the transfer mechanism to the stacking table. The stacking mechanism comprises a pair of interconnected horizontally reciprocating rods 82—82 having fingers 83—83 at their ends. During the period of dwell of the frame 70, while one match book is being delivered to the uppermost holder 72 of the frame, the rods 82 move the fingers 83 in a direction from right to left as seen in Figures 2 and 3, to push the match book from the holder 72 onto the delivery table 19. Match books are thus stacked on the table one against another with alternate books reversed so that the thin end of one book is between the thick end of two adjacent books and with the flaps of all the books facing in the same direction.

In compliance with the requirements of the patent statutes I have here shown and described a preferred embodiment of my invention. It is, however, to be understood that the invention is not limited to the precise construction here shown, the same being merely illustrative of the principles of the invention. What I consider new and desire to secure by Letters Patent is:

1. In a match book making machine wherein match books are advanced in a line step by step along a path in a direction from the back towards the front of the machine and with the thin ends of the books all facing in the same direction, stacking mechanism for stacking the books in a row below and at right angles to the aforesaid path of movement of the books, a reversing mechanism receiving the successive books of a line of books and reversing only alternate ones, and a transfer mechanism receiving the books from the reversing mechanism and transferring them to the stacking mechanism.

2. In a match book making machine, book reversing mechanism comprising a receiver having means for gripping and holding match books, means for discharging successive books from the receiver, said receiver being rotatable about an axis passing centrally through and substantially at right angles to a flat side of the book held in said gripping means, means for rotating the receiver about said axis through an angle of 180° for each alternate book delivered to the receiver, the receiver remaining stationary for the intervening alternate books, and a transfer mechanism receiving the books from the reversing mechanism.

3. In a match book making machine, book reversing mechanism including a receiver for books, means for discharging successive books from the receiver, means mounting said receiver for rotation about an axis passing centrally through and substantially at right angles to a flat side of the book, means for rotating the receiver about said axis through an angle of 180° for each alternate book delivered to the receiver, the receiver remaining stationary for the intervening alternate books, and a transfer mechanism receiving the books from the reversing mechanism, said transfer mechanism comprising a rotating frame member having a plurality of receivers carried by the periphery of the frame and stationary with respect thereto, said frame being rotatable

about an axis at right angles to the axis of rotation of the receiver of the reversing mechanism.

4. In a match book making machine wherein match books are slid one after the other along a support with the thin ends all facing in the same direction, a stacking mechanism, means for successively reversing alternate books and delivering all of the books to the stacking mechanism, said means comprising a reversing mechanism through which the support extends, said reversing mechanism having means for receiving and gripping each of the successive books and reversing only the alternate ones, and a transfer mechanism, said reversing mechanism and said transfer mechanism operating on different books simultaneously and means for delivering the books from one of said mechanisms to the other, said mechanisms being rotatable about axes at right angles to one another.

5. In a match book making machine wherein match books are slid along a support with the thin ends all facing in the same direction, a stacking mechanism, means for successively reversing alternate books and delivering all of the books to the stacking mechanism, said means comprising a reversing mechanism and a transfer mechanism operating on different books simultaneously and means for delivering the books from one of said mechanisms to the other, said mechanisms being rotatable about axes at right angles to one another, said reversing mechanism including a receiver over the support and past which the support extends, said receiver receiving successive books, means for rotating the receiver through 180° for each alternate book received, said receiver being stationary for each intervening alternate book, said transfer mechanism being in advance of the reversing mechanism and receiving all of the books therefrom, whereby alternate books received by the transfer mechanism are reversed.

6. In a match book making machine wherein matches are slid along a support with the thin ends all facing in the same direction, a stacking mechanism, means for successively reversing alternate books and delivering all of the books to the stacking mechanism, said means comprising a reversing mechanism and a transfer mechanism operating on different books simultaneously and means for delivering the books from one of said mechanisms to the other, said two last named mechanisms being rotatable about axes at right angles to one another, said reversing mechanism including a receiver for receiving successive books, means for rotating the receiver through 180° for each alternate book received, said receiver being stationary for each intervening alternate book, the axis of rotation of the receiver being at right angles to a flat side of the match book and passing centrally there-through, said transfer mechanism being in advance of the reversing mechanism and receiving all of the books therefrom whereby alternate books received by the transfer mechanism are reversed.

7. In a match book making machine wherein the match books are slid along a support with the thin ends of the books all facing in the same direction, a reversing mechanism having a pair of arms between which the books are successively moved one at a time with a period of dwell between the arms, means for rotating the reversing mechanism through 180° during the period of dwell of alternate books between the arms and maintaining the reversing mechanism stationary

during the periods of dwell of the intervening alternate books, the axis of rotation of the reversing mechanism being at right angles to a flat side of the book and passing through the center thereof, a transfer mechanism receiving the successive books from the reversing mechanism, said transfer mechanism comprising a rotating frame having a plurality of receivers on the periphery thereof and all stationary with respect to the frame, said frame being rotatable about an axis at right angles to the axis of rotation of the reversing mechanism, and means for rotating the transfer mechanism intermittently through a fixed angle during each period of dwell in the movement of the match books on the support, whereby the reversal of each alternate match book takes place while a book in advance thereof is being transferred by the rotating frame.

8. In a match book making machine wherein the match books are slid along a support with the thin ends of the books all facing in the same direction, a pusher mechanism pushing the books along the support in a step by step manner, a reversing mechanism having a pair of arms between which the books are successively moved one at a time with a period of dwell between the arms, means for rotating the reversing mechanism through 180° during the period of dwell of alternate books between the arms and maintaining the reversing mechanism stationary during the periods of dwell of the intervening alternate books, the axis of rotation of the reversing mechanism being at right angles to a flat side of the book and passing through the center thereof, said arms being entirely above the support and gripping the edges of the book and turning the book while the book remains supported by the support and slides on the support through a 180° angle, said pusher mechanism pushing the books through the arms with a period of dwell between the arms, a transfer mechanism receiving the successive books from the reversing mechanism, said transfer mechanism comprising a rotating frame having a plurality of receivers on the periphery thereof and all stationary with respect to the frame, said frame being rotatable about an axis at right angles to the axis of rotation of the reversing mechanism, said pusher mechanism pushing the books from the arms to the transfer mechanism, and means for rotating the transfer mechanism intermittently through a fixed angle during each period of dwell in the movement of the match books on the support, whereby the reversal of each alternate match book takes place while a book in advance thereof is being transferred by the rotating frame.

9. In a match book making machine including a slide upon which match books are slid in a step by step manner to different stations where different operations are performed upon the books in the process of manufacture, a pusher mechanism pushing the books in a step by step manner from station to station, a book receiver positioned above the slide and through which the pusher pushes the books on the slide one at a time with a period of dwell while each book is in the receiver, means for rotating the receiver through 180° during alternate periods of dwell and maintaining the receiver stationary during the periods of dwell of the intervening alternate books, whereby alternate books are reversed in their passage through the receiver.

10. In a match book making machine including a slide upon which match books are slide in a step by step manner to different stations where differ-

ent operations are performed upon the books in the process of manufacture, a pusher mechanism pushing the books in a step by step manner from station to station, a book receiver positioned above the slide and including arms through which the pusher pushes the books one at a time with a period of dwell while each book is in the receiver, means for rotating the receiver through 180° during alternate periods of dwell and maintaining the receiver stationary during the periods of dwell of the intervening alternate books, whereby alternate books are reversed in their passage through the receiver arms, said receiver gripping the edges of a book while the book rests on the slide, said arms turning the book as it rests on the slide.

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11. In a match book making machine, a reversing mechanism including means for receiving successive books and reversing alternate books, a transfer mechanism including means for receiving all of the books from the reversing mechanism one at a time and turning all of the books through substantially 90°, and a pusher mechanism operable by a continuous motion to push one book from the reversing mechanism and a succeeding book spaced therefrom into the reversing mechanism while maintaining the two books spaced apart.

MORRIS SPECTOR.