

March 9, 1943.

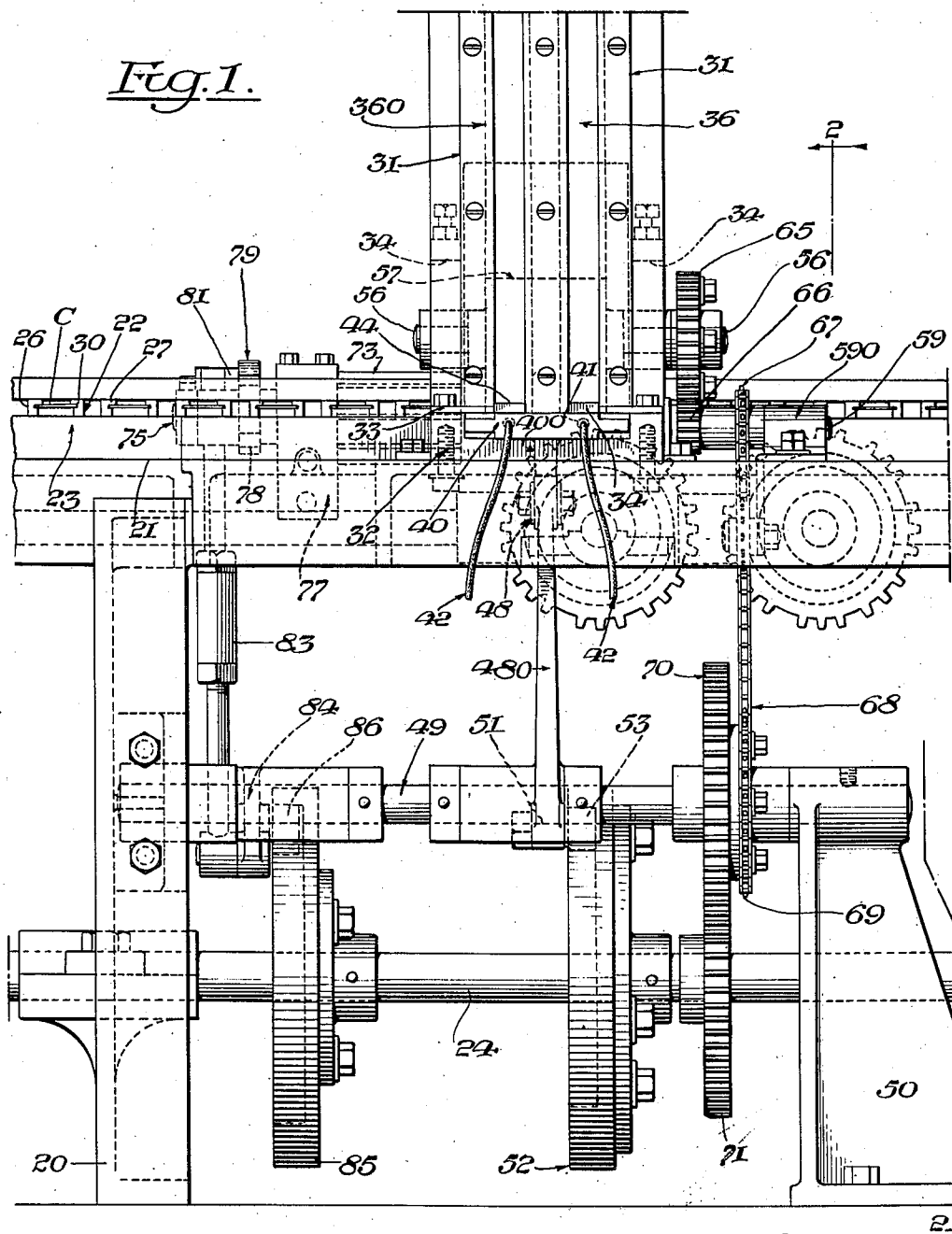
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2,313,609

COVER FEEDING, SCORING, AND FOLDING MEANS FOR MATCH BOOKING MACHINES

Filed Dec. 19, 1941

6 Sheets-Sheet 1



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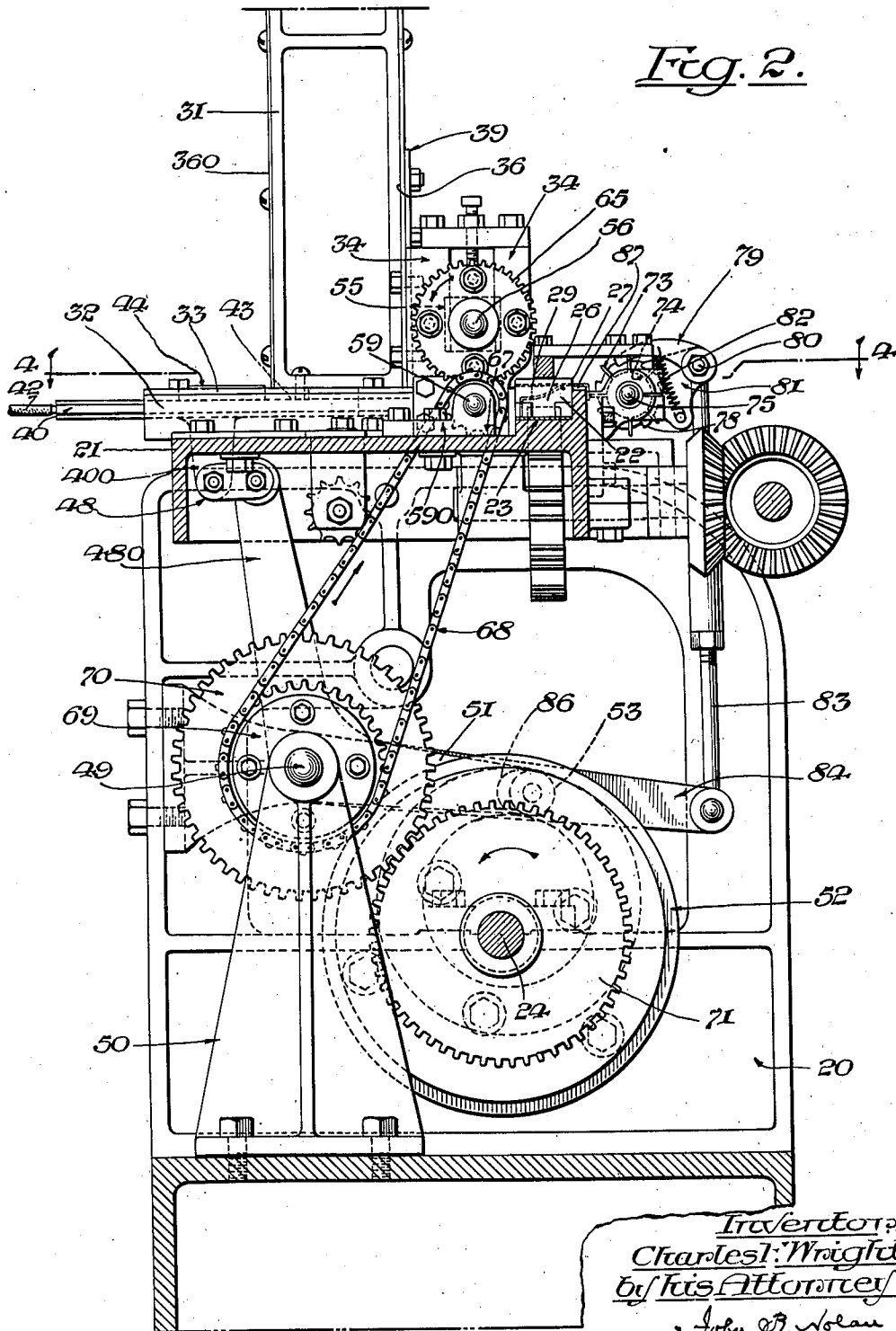
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Fig. 2.



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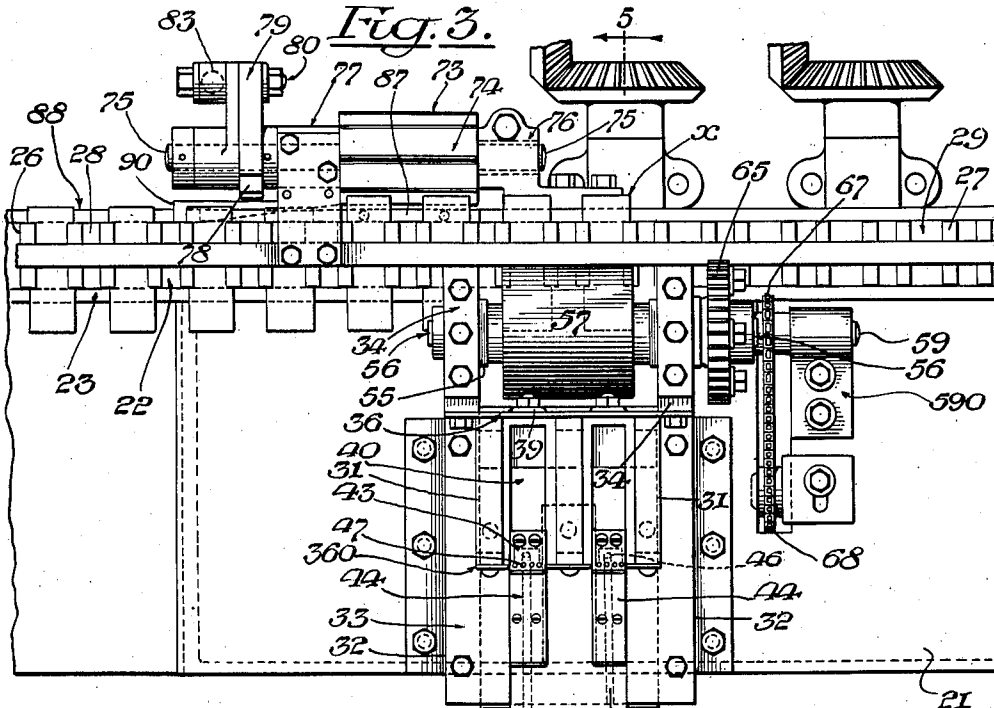
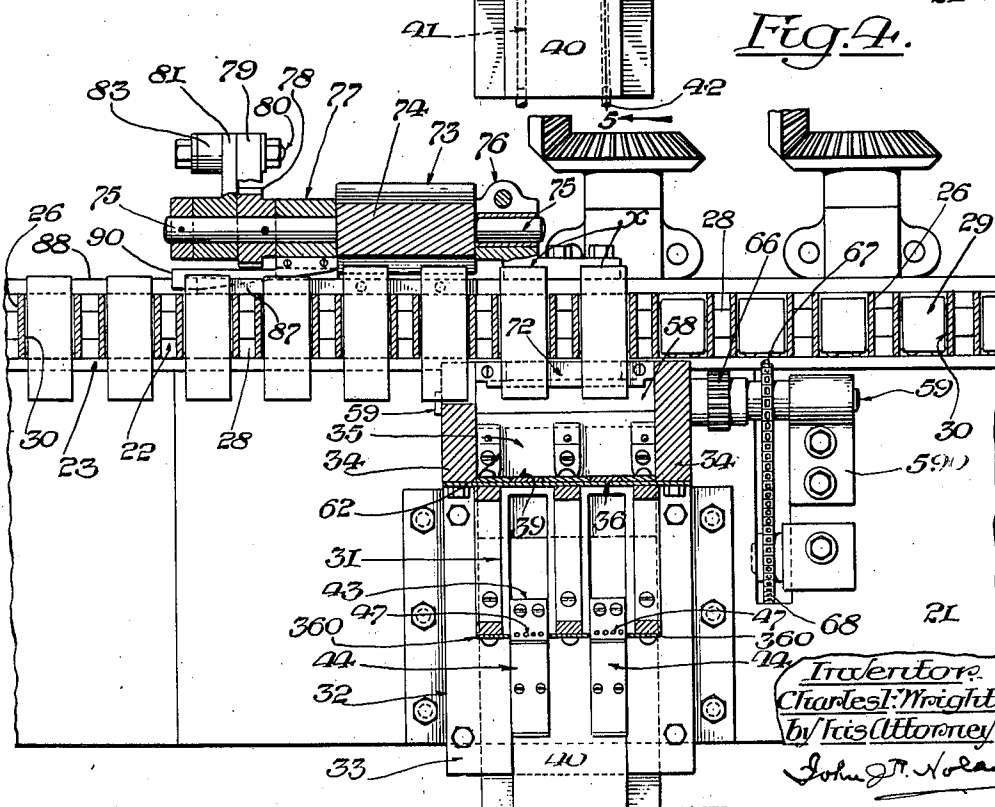
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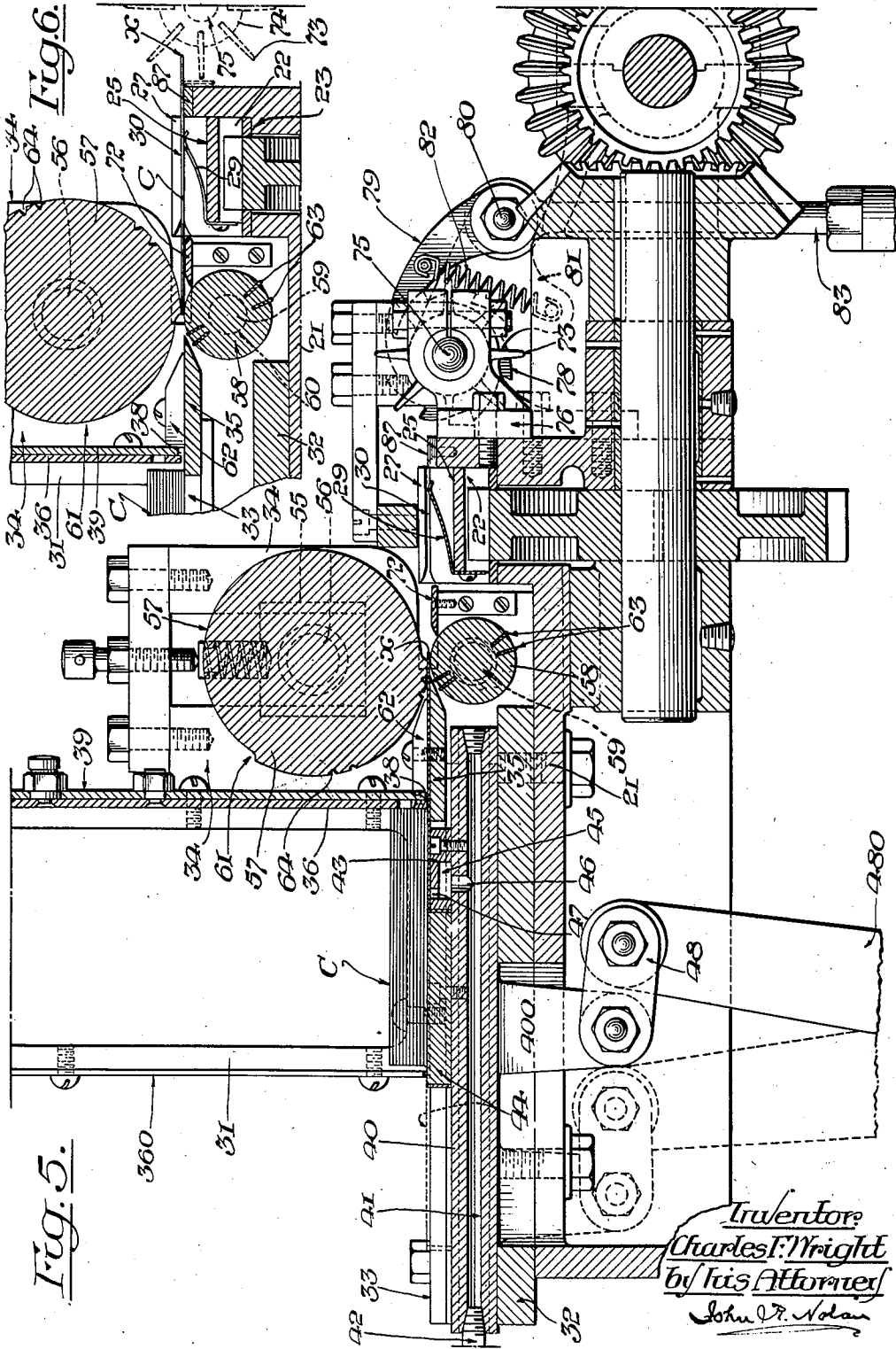
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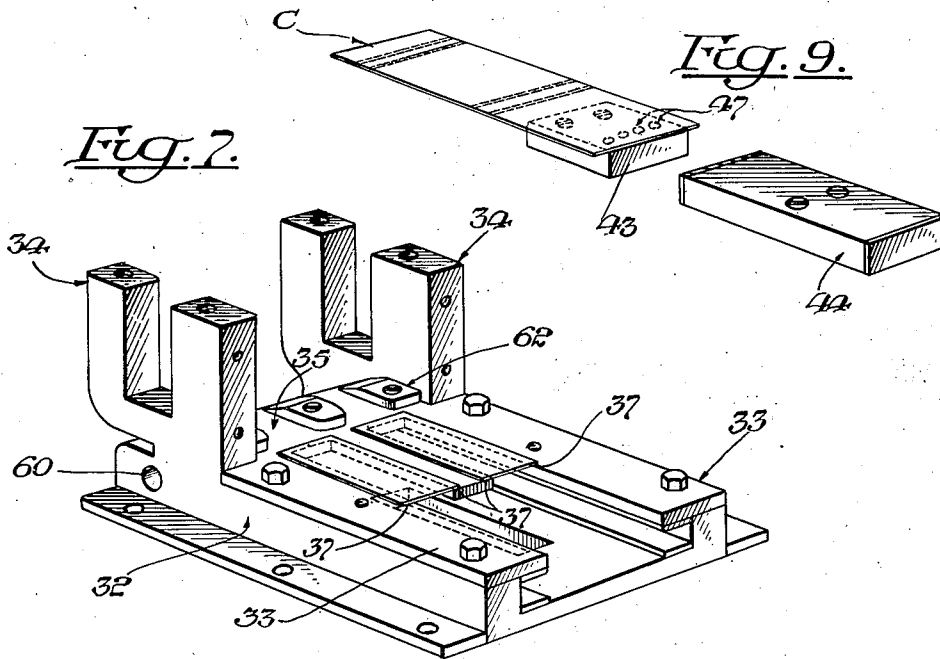
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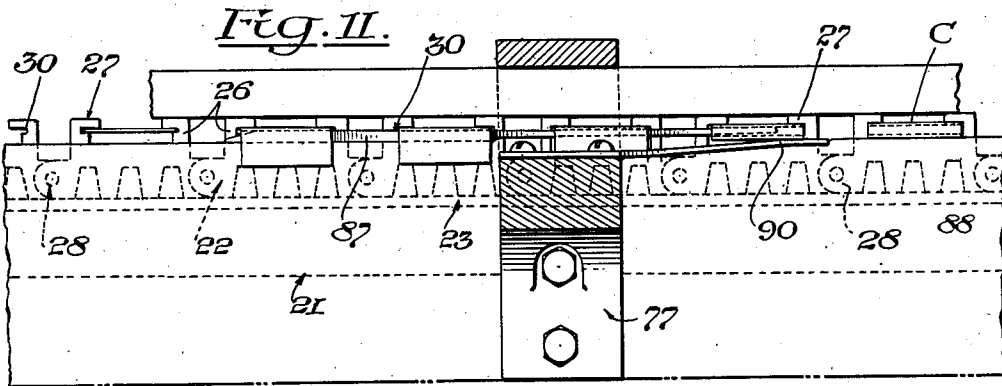
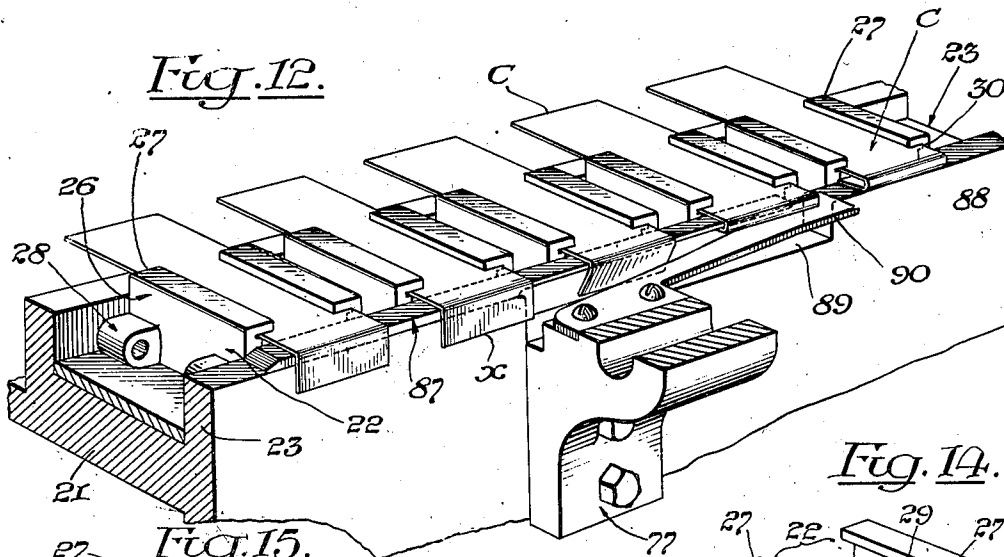
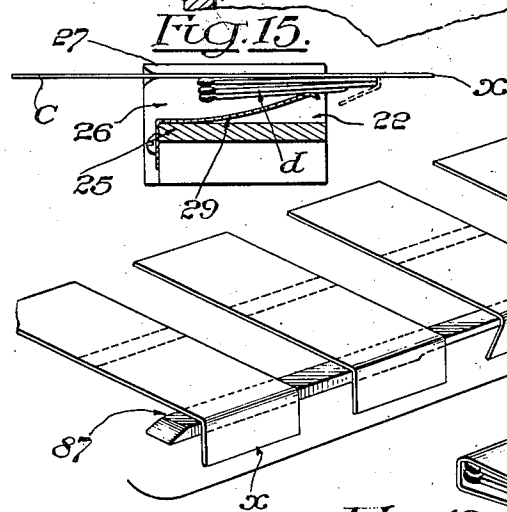
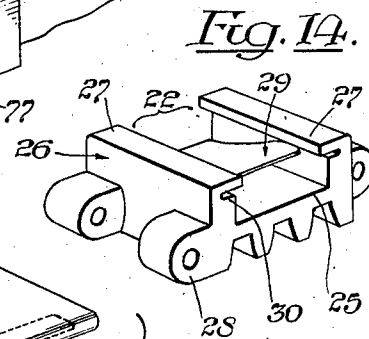
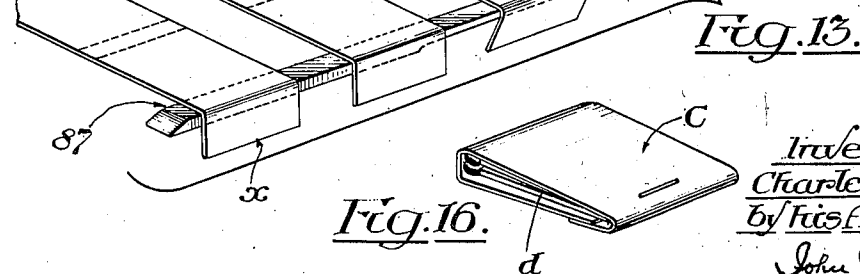
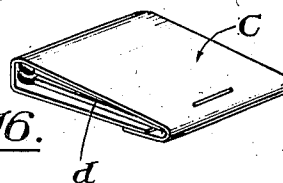


Fig. 16.



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UNITED STATES PATENT OFFICE

2,313,609

COVER FEEDING, SCORING, AND FOLDING
MEANS FOR MATCH BOOKING MACHINESCharles F. Wright, Akron, Ohio, assignor to The
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Application December 19, 1941, Serial No. 423,582

7 Claims. (Cl. 93—2)

This invention relates to booking machines, more particularly machines of the type in which flexible covers of paper-board or the like are fed to an endless carrier and are thereby borne successively to co-ordinated match comb assembling and other mechanisms.

An object of my invention is to provide simple and efficient means for feeding the covers to the carrier and at the same time accurately scoring the strips on suitably located transverse fold lines.

Another object of the invention is to provide for the efficient folding of the covers to receive the match combs during the progress of the carrier.

With these and other objects in view my invention comprises novel features of construction and combinations of parts which in a preferred embodiment of the invention will be hereinafter described; the scope of the invention being expressed in the following claims.

In the drawings—

Figure 1 is an elevation of a portion of a match booking machine embodying my invention.

Fig. 2 is a transverse vertical section through the machine, as on the line 2—2 of Fig. 1, the cover feeding slide beneath the cover magazines being shown in its retracted position.

Fig. 3 is a plan of the mechanism shown in Fig. 2.

Fig. 4 is a horizontal section, as on the line 4—4 of Fig. 2.

Fig. 5 is a transverse vertical section, as on the line 5—5 of Fig. 3, but showing the cover feeding slide at the limit of its forward or delivery position, with the leading end of the cover advanced slightly beyond the bite of feeding and scoring rolls hereinafter deferred to.

Fig. 6 is a similar view of a portion of Fig. 5, but showing the cover fully advanced by the rolls and positioned in a link of the carrier of the booking machine.

Fig. 7 is a detail perspective view of a guide structure for the cover feeding slide, showing covers supported by the structure.

Fig. 8 is a similar view of the slide, the covers being shown as positioned on the slide.

Fig. 9 is a similar view of cover supporting block elements removed from the slide, showing a cover on the forward block.

Fig. 10 is a perspective view of a "paddle" wheel for bending the projecting ends of the covers borne by the carrier, showing the mounting for the wheel and also pawl and ratchet devices for actuating the wheel.

Fig. 11 is a partial elevation of the guide trough for the carrier, showing the mandrel and co-acting cam member for folding the bent projecting ends of the covers borne by the carrier, the supporting bracket for the cam member being shown in section.

Fig. 12 is a perspective view of the elements shown in Fig. 11, illustrating the folding action of the mandrel and cam member on the covers.

Fig. 13 is a separate view of the mandrel showing succeeding positions of the ends of the covers while being folded.

Fig. 14 is a perspective view of a carrier link.

Fig. 15 is a vertical section through one of the links, showing therein a cover and associated match combs.

Fig. 16 illustrates a complete match book.

Referring to the drawings, 20 designates the supporting frame including the table 21 of a match booking machine. 22 designates a portion of the intermittently-movable pocketed carrier whereof the upper run is guided in a trough 23 on the table, and 24 designates the main cam shaft which, through suitable cam and transmission mechanisms, actuates the carrier and other moving parts of the machine.

The carrier illustrated embodies an endless chain of clamping links whereof each link comprises a base 25 with parallel side walls 26 having inwardly overhanging flanges 27, and having also suitably-disposed ears 28 by means of which the adjoining links are hingedly connected by pins. Within each link is arranged in the space between the side walls 26 a spring clamping leaf 29 the forward end of which inclines toward and yieldingly co-acts with the opposing under surfaces of the respective flanges of the link. As heretofore constructed the distance between the inner side walls of each link has been equal or substantially so to the width of a match book cover, and hence the cover was unsupported except by the pressure exerted by the spring leaf at the inner edges of the flanges 27 adjacent one end of the cover. Moreover, in the use of match combs of less width than the cover there was play between the edges of the combs and the walls of the link, which play permitted lateral displacement of the combs in relation to the cover during the endwise insertion of the combs within the link by the usual comb inserting mechanism.

In order to provide for the efficient guidance and support of the edges of the cover throughout the length of the link, and also to ensure the accurate positioning in the link of the match

combs, *d*, in relation to the inserted cover, I make the space between the inner walls of the link the same in width, or substantially so, as the match comb, and I also provide the walls throughout their length immediately beneath the flanges 27, with parallel narrow grooves 30 which nicely receive the edges of the cover, as will presently appear. (See Figs. 5 and 6, and 11 to 15, inclusive.)

The particular form of mechanism illustrated is designed to act upon successive pairs of covers, C, and insert a single cover in each of two adjoining links of the carrier. To this end stacks of superposed covers are freely contained in spaced magazines 31 which are suitably supported in proximity to one side of the path of the carrier by means of a guide structure bolted to the table. As shown the guide structure comprises a channeled base 32 and a skeleton plate 33 secured thereon, the magazines being bolted to the plate and to adjacent posts 34 at the forward end of the base, which posts also perform a function hereafter mentioned. The plate presents at its inner end an under bevelled cover supporting portion 35 extending beyond the magazine walls 36 facing the carrier, and also affords supporting surfaces 37 for the longitudinal marginal portions of the covers contained in the respective magazines. See Figs. 5 to 9, inclusive. The lower ends of the magazine walls 36 are slightly spaced above the top of the plate, as at 38, to afford an opening to permit the free passage, endwise, of the lowermost covers from the magazines. The forward wall of each of the magazines is preferably provided with a vertically adjustable plate 39 by means of which the size of the opening may be regulated as occasion may require.

Mounted in the base of the guide structure for reciprocation toward and from the path of the carrier, is a slide 40 which is provided with longitudinal ducts 41 closed at one end of the slide and open at the opposite end thereof. The open ends of the ducts are each connected with a hose 42 leading to a suitable air exhausting device (not shown). Secured to the top of the slide, directly under each of the magazines, are two blocks 43 and 44 in end to end relation, the top of the forward block being flush with the upper surface of the plate 33, and the top of the rearward block being slightly higher to accord with the thickness of a cover, thus presenting an abutment to the rear edge of the lowermost cover during the forward stroke of the slide, as will presently appear. The under surfaces of the blocks 43 are transversely recessed to afford exhaust chambers 45 which communicate with the underlying ducts 41 of the slide 40 through ports 46 and with the interior of the magazines through perforations 47 in the tops of the blocks 43. (See Figs. 5, 8 and 9.) Hence during the stroke of the slide 40 toward the carrier the lowermost covers supported in the magazines, are maintained flatwise upon the blocks 43 by exhausting the chambers 45, and at the same time the rearward blocks 44, abutting the opposing ends of the covers, partially project such covers beyond the respective magazines, the columns of covers within the latter being uniformly supported by the rearward blocks 44, as seen in Fig. 5. In the succeeding return stroke of the slide the "suction" blocks 53 move to and in line with the rearward walls 360 of the magazines and beneath the confined columns of covers, thus positioning such blocks in accurate relation to

the rearward edges of the confined covers before the next succeeding forward or delivery stroke of the slide. The outer ends of the partially projected lowermost covers are gripped and held, as hereinafter described, before the initial rearward stroke of the slide, and therefore in that stroke the columns of covers are permitted to move bodily backward in the magazines a distance equal to the clearance that the covers have in the respective magazines.

Any suitable means for reciprocating the slide and its appurtenances may be employed. In the present instance the slide has a depending lug 400 which is connected by a link 48 with the up-standing arm 480 of a bell-crank loose on a stationary shaft 49 supported by the main frame and by a suitably-disposed standard 50 on the base of the frame. The other arm 51 of the bell-crank extends laterally of a face cam 52 fast on the main cam shaft 24, which arm 51 has a roll 53 operatively fitted in the cam race. The contour of the race is such that the slide is reciprocated toward and from the carrier in timed relation thereto. (See Figs. 1, 2 and 5).

The posts 34 of the guide structure previously referred to are arranged in spaced pairs to afford vertical guides for spring pressure bearing blocks 55 for the shaft or trunnions 56 of a relatively large feed roll 57. This roll is paired with a lower roll 58 which is rotatable concurrently with the upper roll, the shaft or trunnions 59 of the roll 58 having bearings in perforations 60 in the respective side members of the structure 32, one of the trunnions having an extension journaled in a bearing bracket 590 on the table 21. (See Figs. 3 and 4.) The bite of the feed rolls is in the same horizontal plane as the lowermost covers contained in the magazines so as to receive and nip the leading ends of such covers when they are projected, thus bodily withdrawing the covers from the magazines and advancing their leading ends into the narrow guide grooves 30 in the walls of the adjacent links of the carrier. (See Figs. 5 and 6.)

As illustrated the upper feed roll 57 is circumferentially reduced within a defined area, as at 61, to permit the slide to advance the covers with their leading ends *x* (Fig. 5) slightly beyond a vertical plane extending through the centers of the rolls, preparatory to the gripping of the covers by the rolls, whereupon during the dwell of the carrier such covers are fed thereto by the rolls.

The upper surface of the cover supporting portion 35 of the slide plate 33 adjacent the outer or beveled end thereof, is preferably provided with spaced end beveled blocks 62 which afford edge guides for the covers in their passage to the bite of the rolls, the oppositely inclined beveled portions of the blocks 62 and plate 33 permitting their disposition in close relation to the converging peripheries of the rolls.

The lower roll 58 is provided with circumferential scoring blades 63 extending longitudinally thereof in spaced pairs, and the upper roll has corresponding grooves 64 to accommodate the blades during the concurrent rotation of the rolls, which blades and grooves are so relatively spaced as to indent or score the under surfaces of the covers and produce therein parallel fold lines at the midsections and at the stub ends of the covers.

There is a sufficient dwell of the slide at the end of its delivery stroke to maintain the covers in their forward position until the feed rolls are

in gripping relation to the covers, as previously mentioned. Hence there is at all times a definite relation of the score lines in each succeeding cover to one end of the cover.

In the present instance the shafts or trunnions of the feed rolls are operatively connected by meshing gear wheels 65 and 66, and the gear of the lower roll is equipped with a sprocket wheel 67 which is connected by a chain 68 with a similar wheel 69 adjustably fastened to a gear 70 loose on the stationary shaft 49 previously referred to. The gear 70 meshes, in turn, with and is driven by a gear 71 fast on the main shaft 24 of the booking machine. (See Figs. 1 and 2.) The ration of the gearing just described and the proportions of the rolls are such that the rolls are concurrently driven in timed relation with the carrier; that is to say, the diameter of the lower roll 58 is one-third that of the upper roll 57, thus making three rotations to one of the upper roll and to one of the main shaft. Two thirds of the circumference of the upper roll is reduced to escape the covers presented thereto and the remainder of such circumference forms a gripping surface of the covers. In each rotation of the lower roll it co-acts with the contact surface of the upper roll, and therefore, since the intermittently movable carrier dwells during one-half rotation, or substantially so, of the main shaft, it follows that only one cover is fed into each link of an adjacent pair of links during one rotation of the main shaft in the interval of rest of the carrier. A suitably-disposed bridge bar 72 fastened to the guide structure close to the carrier, guides the leading ends of the scored covers into the narrow guide grooves 30 in the inner side walls of the adjacent links of the carrier. (See Fig. 5.)

When the scored covers escape the rolls the covers are clamped flatwise in the carrier links with the leading ends *x* of the covers projecting laterally beyond the links, as seen in Figs. 3 and 6. This done, the carrier and its charged links are moved a distance of two links, thus locating a succeeding pair of empty links in the path of the next succeeding pair of scored covers delivered by the scoring and feeding rolls. In this step of the carrier the projecting ends *x* of the scored covers are located in the path of the radial blades 73 of an intermittently rotatable wheel 74 which extends longitudinally of and in proximity to the path of the carrier. (See Figs. 3, 4, 5, 6 and 10.) The trunnions 75 of the paddle wheel, as it may be termed, is loosely mounted in stationary bearing brackets 76 and 77 secured to the table 21, one of which trunnions has fast thereon a ratchet wheel 78 having teeth corresponding in number with the blades 73. The ratchet wheel is intermittently actuated by a pawl 79 pivotally supported by a stud 80 on a rock arm 81 loose on the adjacent trunnion 75, which pawl is normally held in co-operative relation to the ratchet teeth by means, for example, of a spring 82 which is secured to the pawl and the rock arm. The stud 80 is pivotally connected by means of a depending rod 83 with a lever 84 loose on the shaft 49 previously mentioned. The lever 84 extends laterally of a face cam 85 fast on the main shaft 24, and has a roll 86 operatively fitted in the cam race. (See Figs. 1 and 2.) The contour of the race is such that in each rotation of the main shaft the lever 84 and the connecting rod 83 are operated to cause the pawl to advance the ratchet wheel one tooth while the carrier is at rest, thus

correspondingly advancing the paddle wheel. In the present instance the latter wheel has eight equally spaced radial blades and the ratchet wheel has a corresponding number of teeth, the space between adjacent blades, while the paddle wheel is at rest, allowing the entrance thereinto, of the projecting ends *x* of the advancing scored covers borne by the carrier. In the succeeding dwell of the carrier the paddle wheel is moved counterclockwise one step, and in consequence that blade overlying the ends of two covers impinges such ends and bends them downwardly and temporarily holds them at an angle of approximately 90° against the edge of a bar 87 conveniently supported by the outer wall of the trough adjacent the path of the carrier. In the next succeeding motion of the carrier the scoring and feeding rolls position another pair of scored covers between a pair of blades and the previously bent covers with their angulated ends are at the same time advanced beyond the paddle wheel, that blade of which then in contact with such ends maintaining them temporarily in angulated position until they escape the blade; and so on during the continued operation of the machine the scored covers are delivered in succession, pair by pair, to the guide grooves 30 of the adjacent links of the intermittently moving carrier, with the leading ends of the covers projecting beyond the carrier in position to be advanced to and angularly bent by a blade of the intermittently rotatable wheel.

The bar 87 extends beyond the end of the paddle wheel adjacent the brackets 77, and affords a support throughout its length for the bent ends of the covers when they are advanced from the path of the blades by the carrier. The wall 88 of the trough underlying the extended portion of the bar is cut away, as at 89, thus permitting the folding of the downwardly bent portions of the covers under and against the extension of the bar, which is reduced in thickness to correspond with the fold space of a cover, as seen in Figs. 11, 12 and 13. The extension thus constitutes a mandrel which, in conjunction with an underlying cam piece 90, effects in a rapid and efficient manner the accurate end folding of the progressing covers borne by the carrier. In the present instance the cam piece is securely fastened at one of its ends to the bracket 77, the body of the cam being inclined towards the free end of the mandrel and being suitably formed to press the depending ends of the advancing covers inwardly and upwardly beneath the mandrel. As the covers escape the mandrel the end folds of the covers pass upon and are supported by the opposing wall of the trough, (see Fig. 12) passing thence to mechanisms such as shown in Patent No. 1,042,472 dated October 29, 1912, for introducing the match combs in the end folds of the respective covers, uniting the complementary combs and covers at the cover folds, folding the extended portions of the covers upon the associated matches, and finally tucking the free ends of such portions under the fastened folds of the covers. A match book as completed, is represented in Fig. 16.

It is to be understood that the invention is not limited to the particular exemplifying form thereof herein disclosed, as the mechanism may be modified within the principle of the invention and the scope of the appended claims.

I claim:

1. In a match booking machine, the combination with an intermittently movable carrier hav-

ing a succession of holders for receiving and transporting book elements, of means for introducing flat covers in said holders with the leading end of each cover projecting beyond a holder, stationary bearings adjacent the path of said carrier, a bending element mounted in said bearings for intermittent rotation across the path of the projecting ends of the covers borne by the carrier, and means for actuating said bending element in timed relation to the carrier whereby the movements of said bending element alternate with the movements of the carrier, said bending element comprising a wheel having spaced peripheral members of substantial length extending longitudinally of the carrier, each succeeding member in a movement of the wheel, while the carrier is at rest, bending the opposing projecting end of a cover angularly to the body of the cover, and in the succeeding rest of the wheel maintaining such angular end temporarily in that position coincidentally with a movement of the carrier.

2. In a match booking machine, the combination with a travelling carrier having a succession of holders for receiving and transporting book elements, means for introducing flat covers in said holders with the leading end of each cover projecting beyond the holder, stationary bearings adjacent the path of said carrier, a bending element mounted in said bearings for rotation across the path of the projecting ends of the covers borne by the carrier, means for actuating said bending element in timed relation to the carrier to bend said ends angularly to the bodies of the covers and to maintain the angulated ends temporarily in that position during the succeeding motion of the carrier, and means for thereafter completing the folding of said cover ends, said last-named means including a stationary mandrel located adjacent the carrier and a folding cam co-operating with said mandrel.

3. In a match booking machine, the combination with a travelling carrier having a succession of holders for receiving and transporting book elements, of means for introducing flat covers in said holders with one end of each cover projecting from a holder, stationary bearings adjacent the path of said carrier, a wheel mounted in said bearings and having spaced radial blades extending longitudinally of the carrier to rotate across the path of the projecting ends of the covers borne by the carrier, means for actuating said wheel in timed relation to the carrier to bend the said projecting ends angularly to the bodies of the covers, and to maintain the angulated ends temporarily in that position during the succeeding motion of the carrier, and means for thereafter completing the folding of said cover ends.

4. In a booking machine, the combination with a travelling carrier having a succession of holders for receiving and transporting book elements, of means including rolls for scoring covers and feeding them flatwise into said holders with the leading end of each cover projecting beyond the holders, a bending element mounted adjacent said carrier for rotation across the path of the projecting ends of the covers borne by the carrier, means for actuating said element in timed relation to the carrier to bend the said pro-

jecting ends, and means for thereafter completing the folding of said cover ends.

5. In a booking machine, the combination with a travelling carrier having a succession of holders for covers and match combs, each holder having a pocket open at its respective ends, the space between the side walls of the pocket being substantially equal in width to that of a match comb, and said walls having in their inner sides parallel narrow grooves for the reception and guidance of the edges of a cover of greater width than that of the match comb, of means for introducing the flat covers in said holders at one end thereof to seat the edges of the covers in the grooves of the respective holders with the leading ends of the covers projecting beyond the adjacent ends of the holders, and means for folding the said projecting ends during the progress of the holders.

6. In a booking machine, the combination with a travelling carrier having a succession of holders for receiving and transporting book elements, of a magazine adjacent said carrier for freely containing a stack of covers to permit slight forward and backward movement of the stack within the magazine, means for temporarily supporting and holding the lowermost cover of the stack, means for scoring said lowermost cover and feeding it to a holder of the carrier, said scoring and feeding means located between the carrier and the magazine and adapted periodically to grip and release covers endwise presented thereto, means for reciprocating said supporting and holding means toward and from the feeding and scoring means in timed relation thereto, said cover supporting and holding means in its forward stroke advancing the lowermost cover from the magazine and placing the leading end of the cover in position for engagement by said feeding and scoring means, and said cover supporting and holding means in its succeeding back stroke after the initial engagement of the cover by the feeding and scoring means slightly moving the remaining covers of the stack rearwardly and against the opposing wall of the magazine.

7. In a booking machine, the combination with a travelling carrier having a succession of holders for receiving and transporting book elements, of a magazine adjacent said carrier for freely containing a stack of covers, means including a suction member for supporting the lowermost cover of the stack, complementary rolls for scoring said lowermost cover and feeding it to a holder of the carrier, one roll having a circumferential contact portion substantially the length of a cover, means for concurrently actuating said rolls, and means for reciprocating said supporting and holding means toward and from the rolls in timed relation thereto, said supporting and holding means in its forward stroke advancing the lowermost cover from the magazine and placing the leading end of the cover tangentially between and slightly beyond the bite of the rolls preparatory to the gripping action of the rolls, and said supporting and holding means in its succeeding back stroke after the initial gripping of the cover slightly moving the remaining covers of the stack rearwardly and against the opposing wall of the magazine.

CHARLES F. WRIGHT.