Sept. 14, 1937. W. E. JENSEN ET AL 2,092,760

CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 1

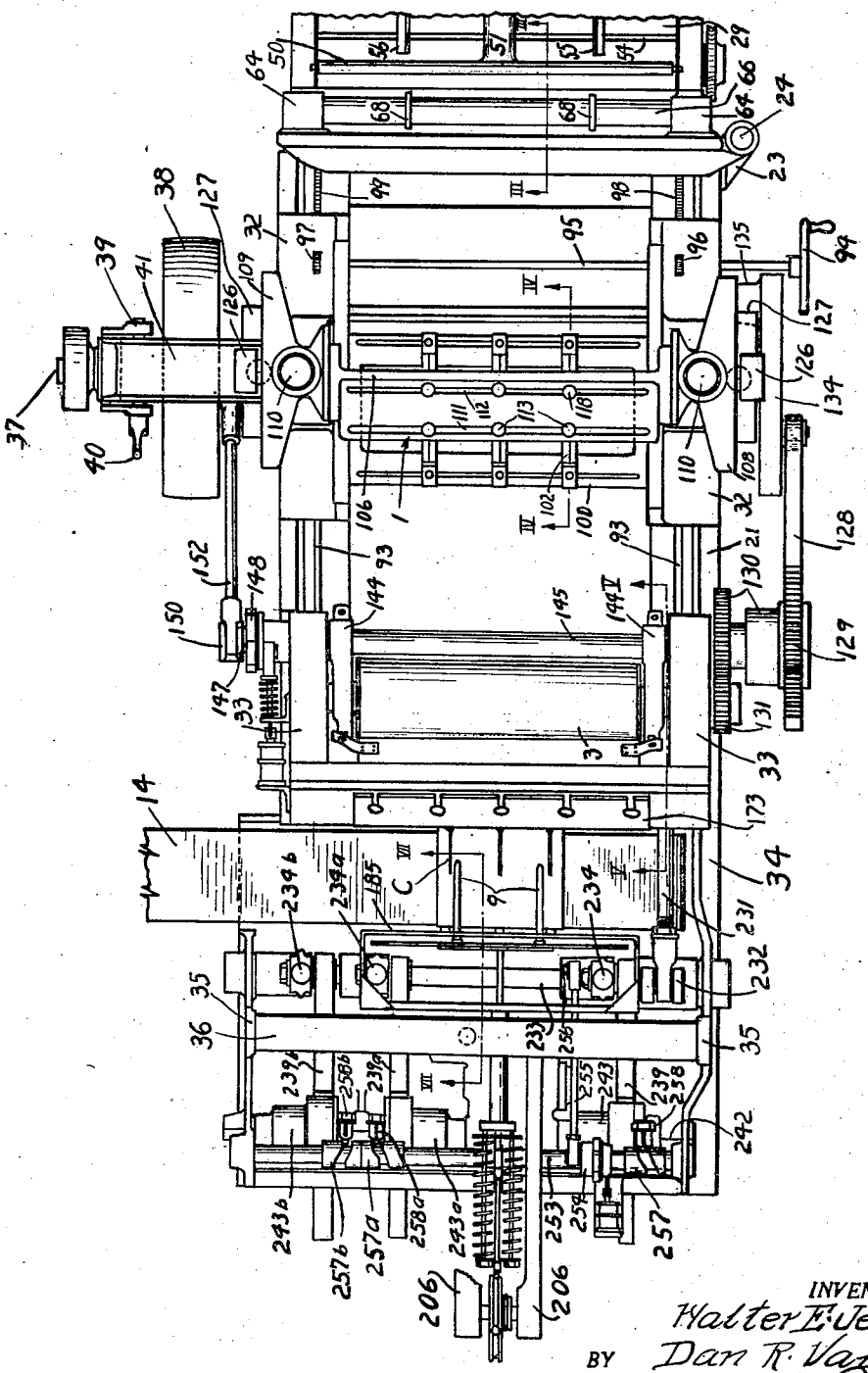


FIG. 1

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Sept. 14, 1937. W. E. JENSEN ET AL 2,092,760

CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 2

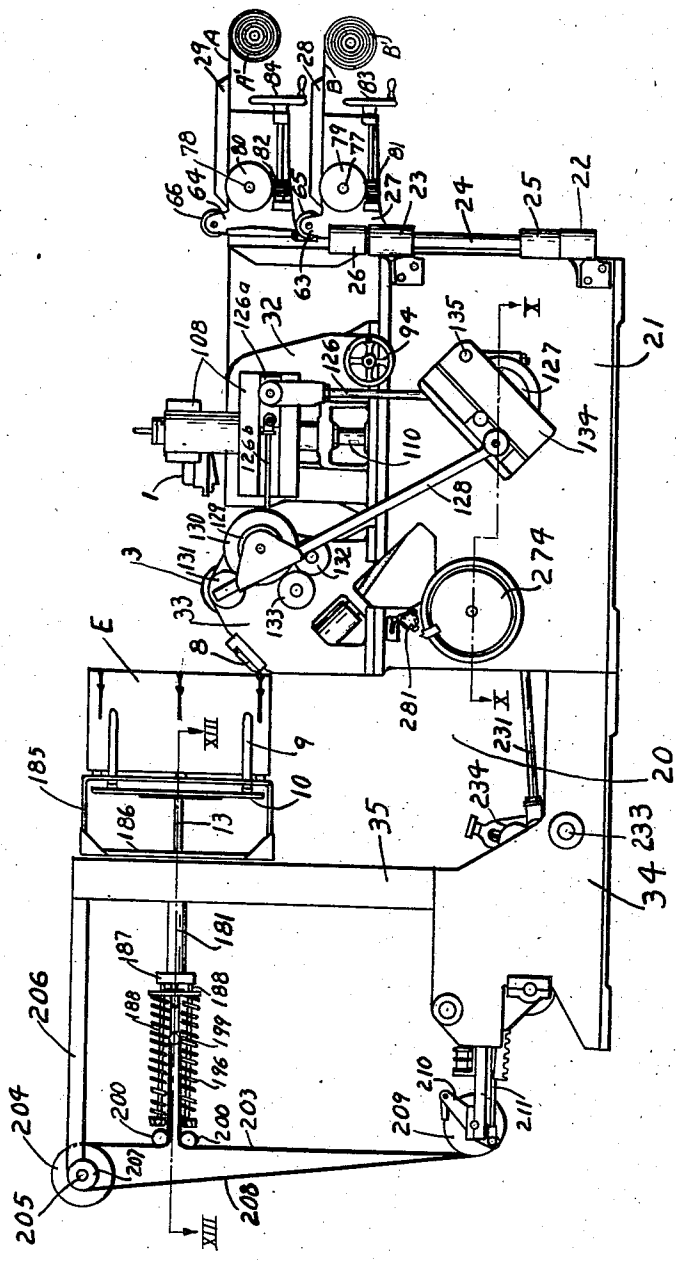


FIG. 2

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CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 3

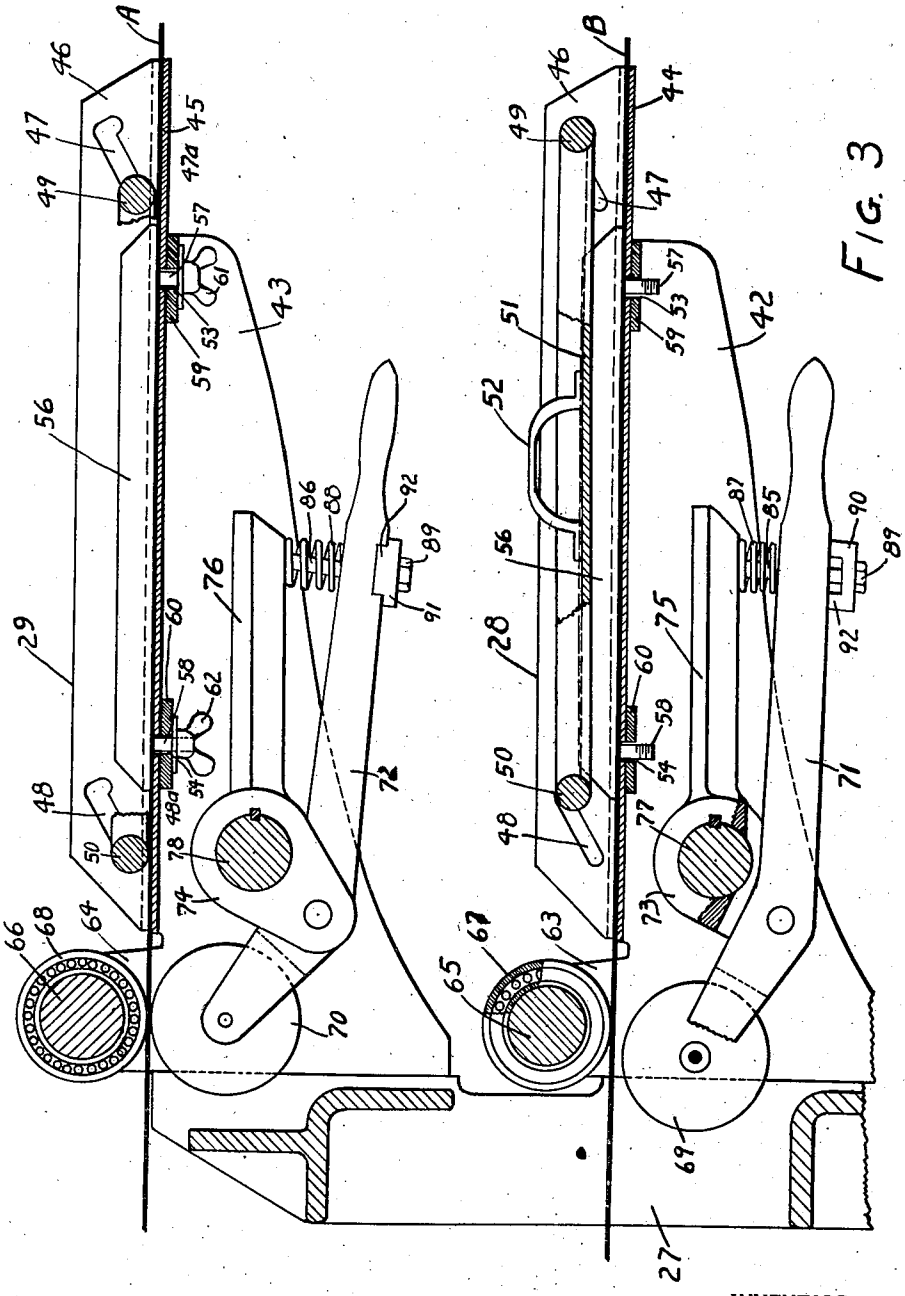


FIG. 3

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CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 4

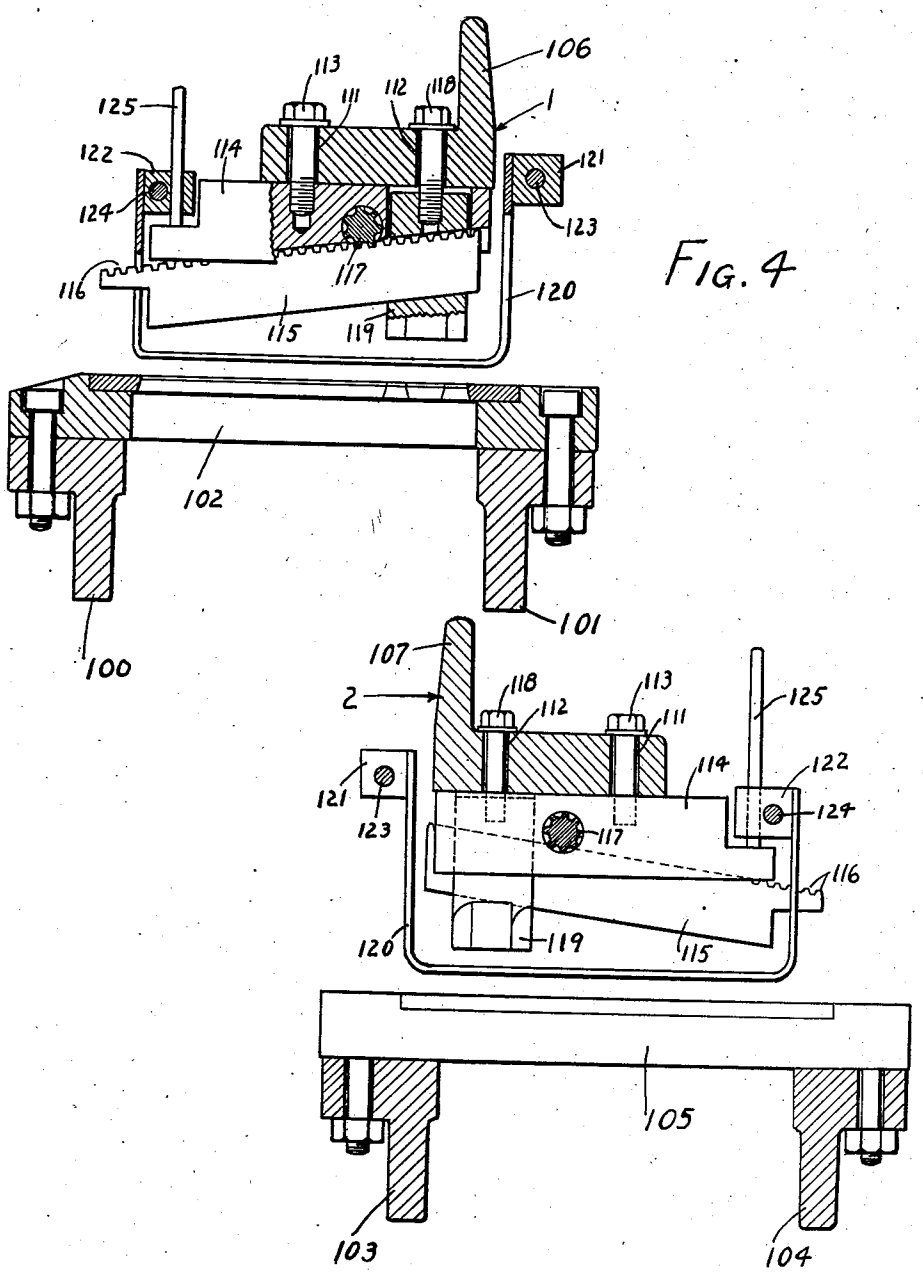


FIG. 4

FIG 4a

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Sept. 14, 1937. W. E. JENSEN ET AL 2,092,760

CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 5

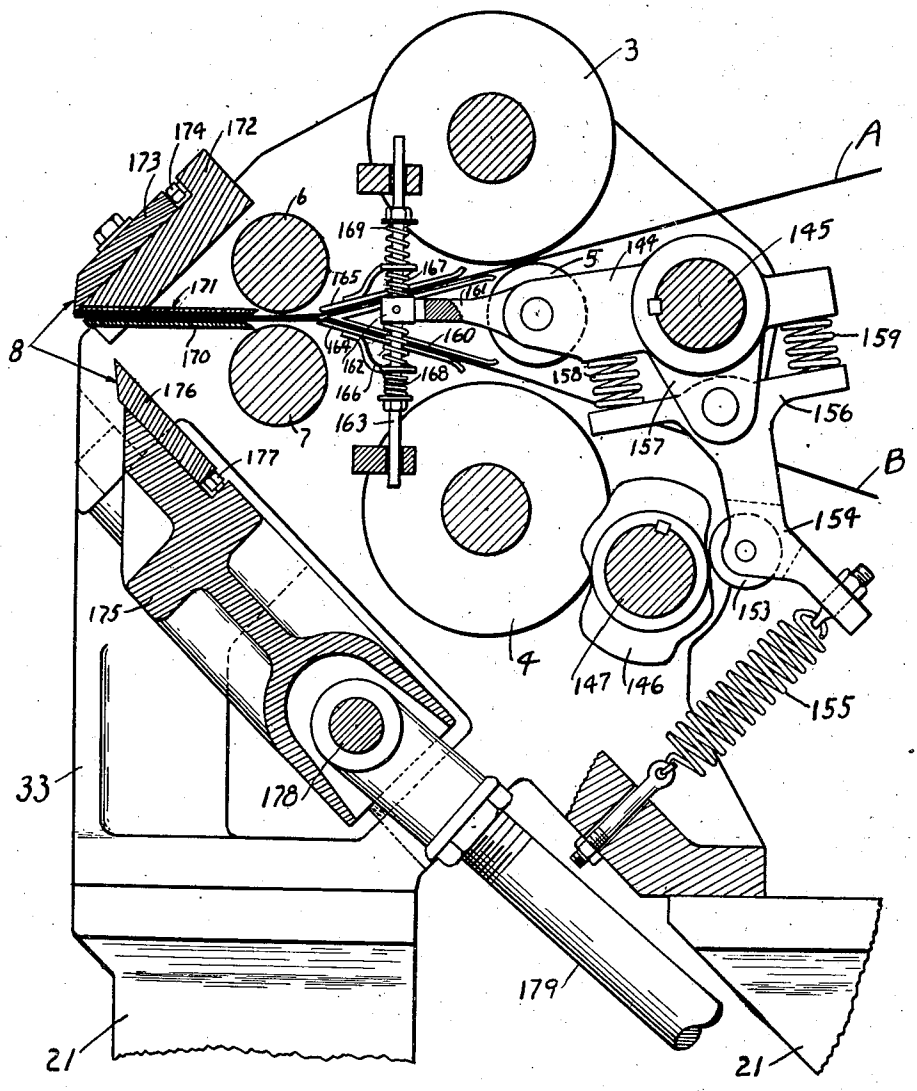


FIG. 5

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Sept. 14, 1937. W. E. JENSEN ET AL 2,092,760

CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 6

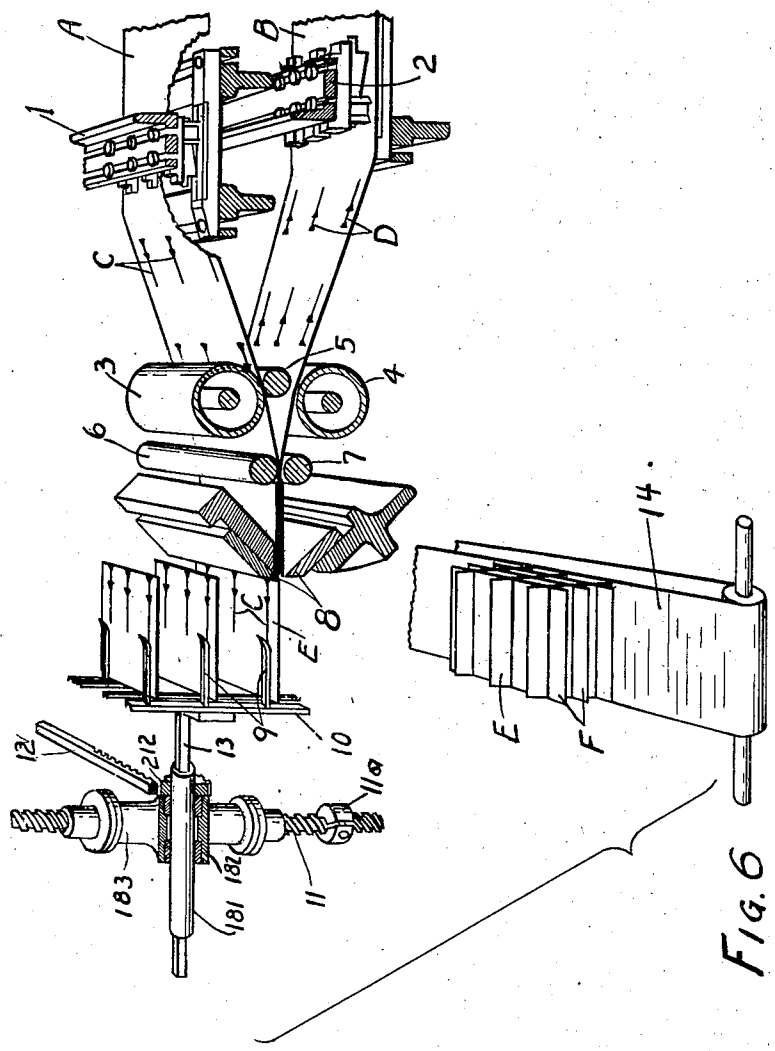


FIG. 6

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Sept. 14, 1937. W. E. JENSEN ET AL 2,092,760

CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 7

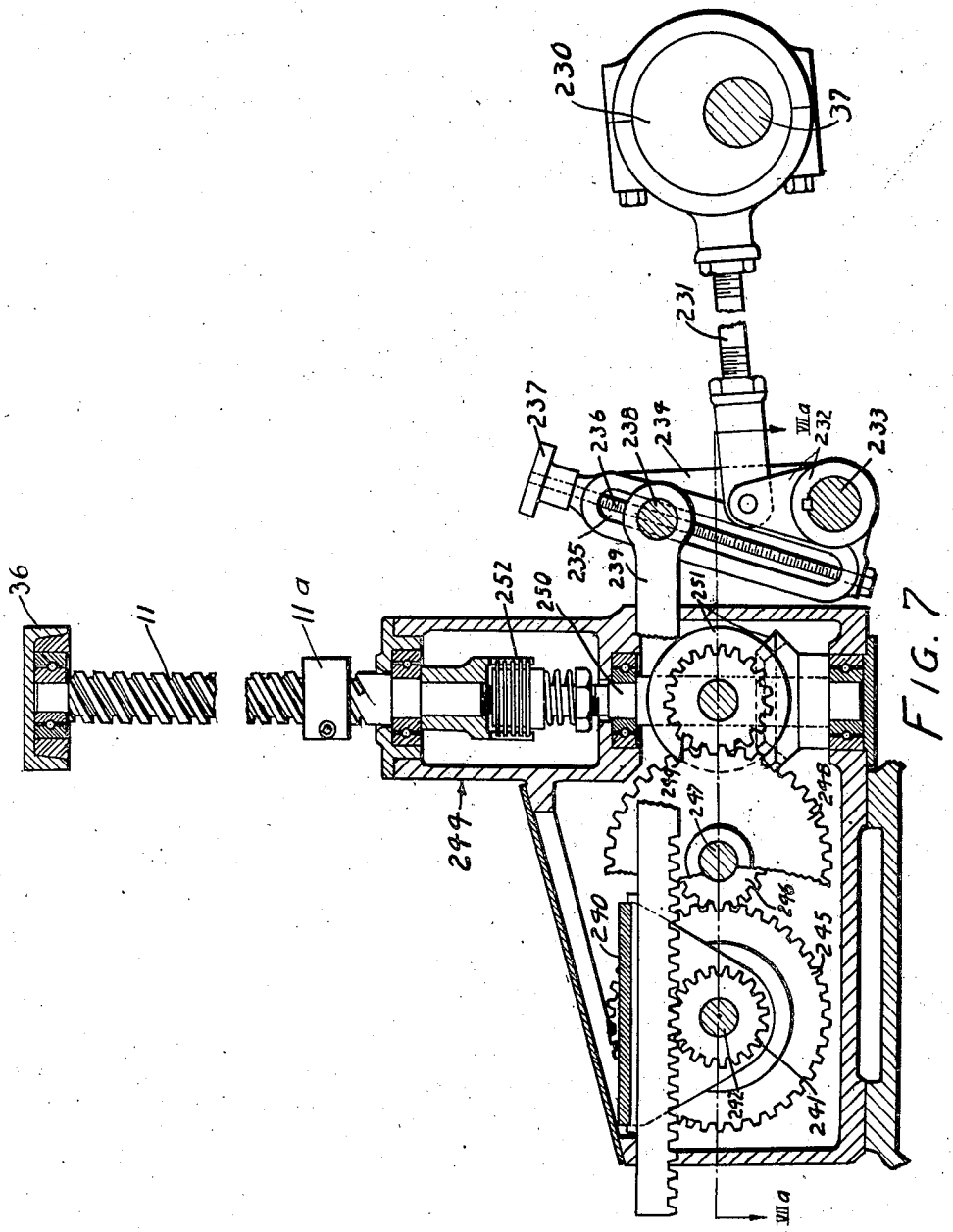


FIG. 7

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CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 8

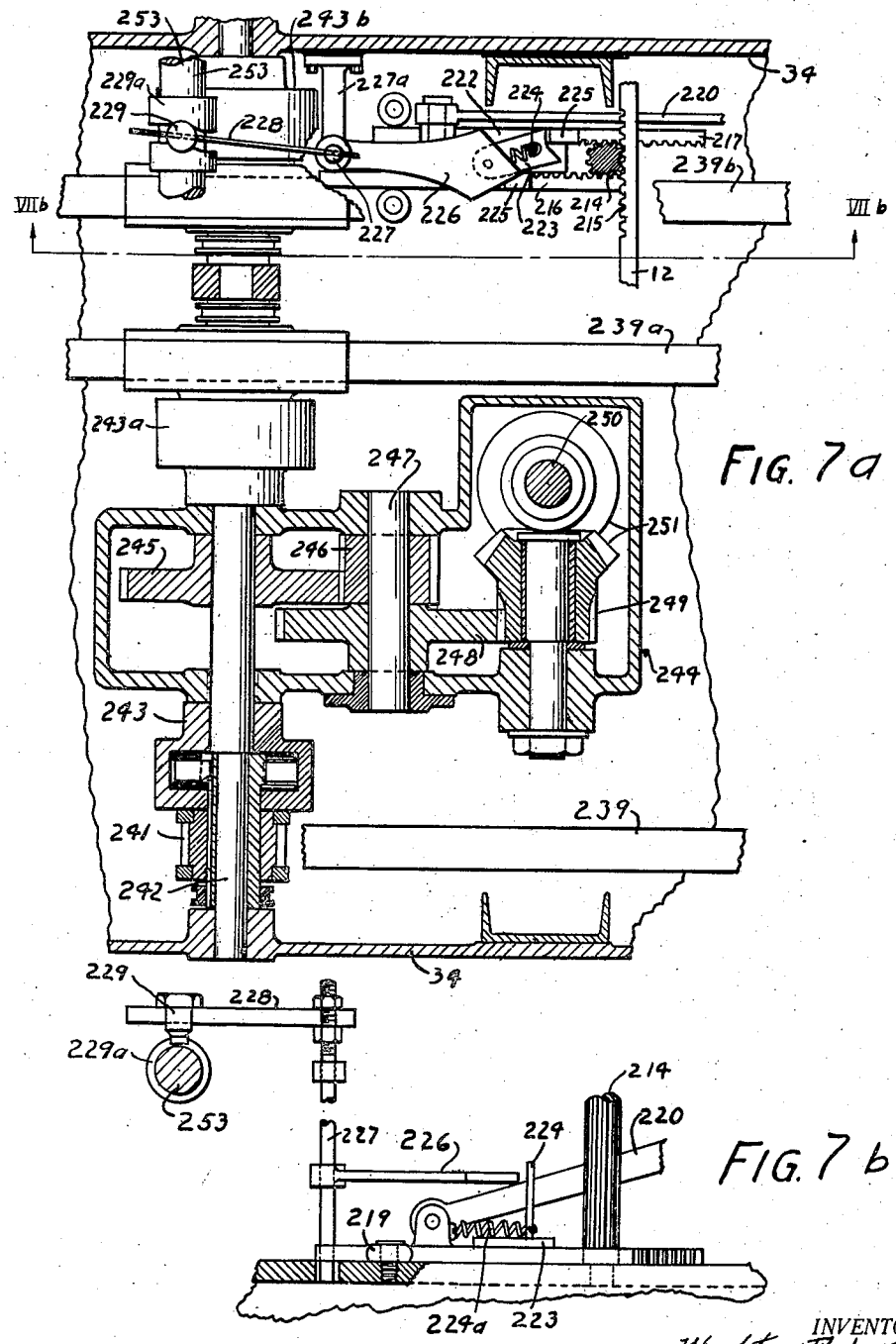


FIG. 7a

FIG. 7b

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Sept. 14, 1937. W. E. JENSEN ET AL 2,092,760

CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 9

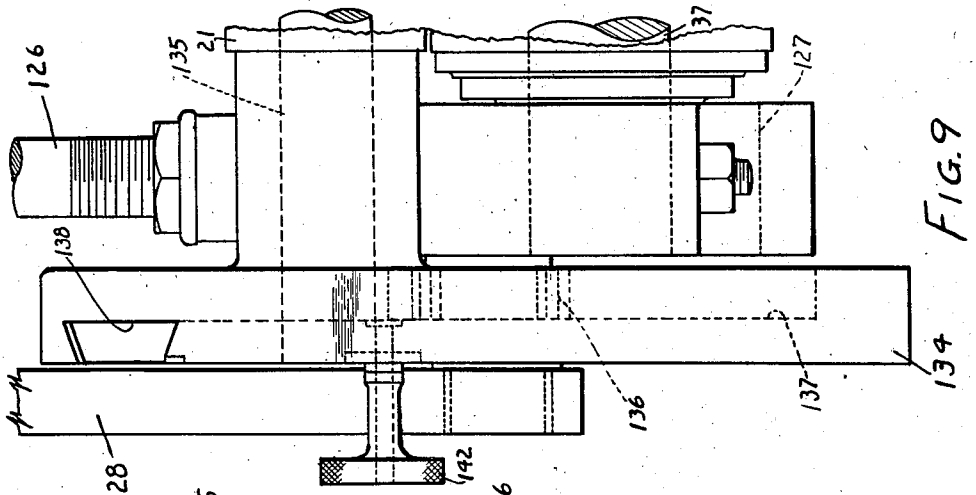


FIG. 9

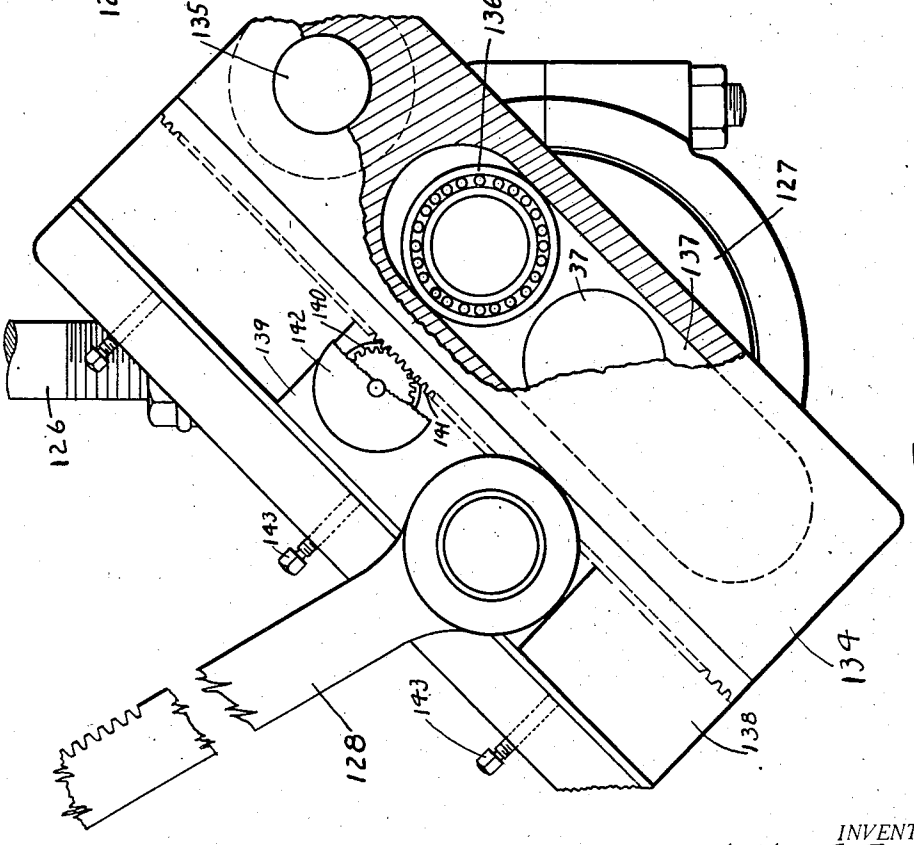


FIG. 8

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Sept. 14, 1937. W. E. JENSEN ET AL 2,092,760

CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 10

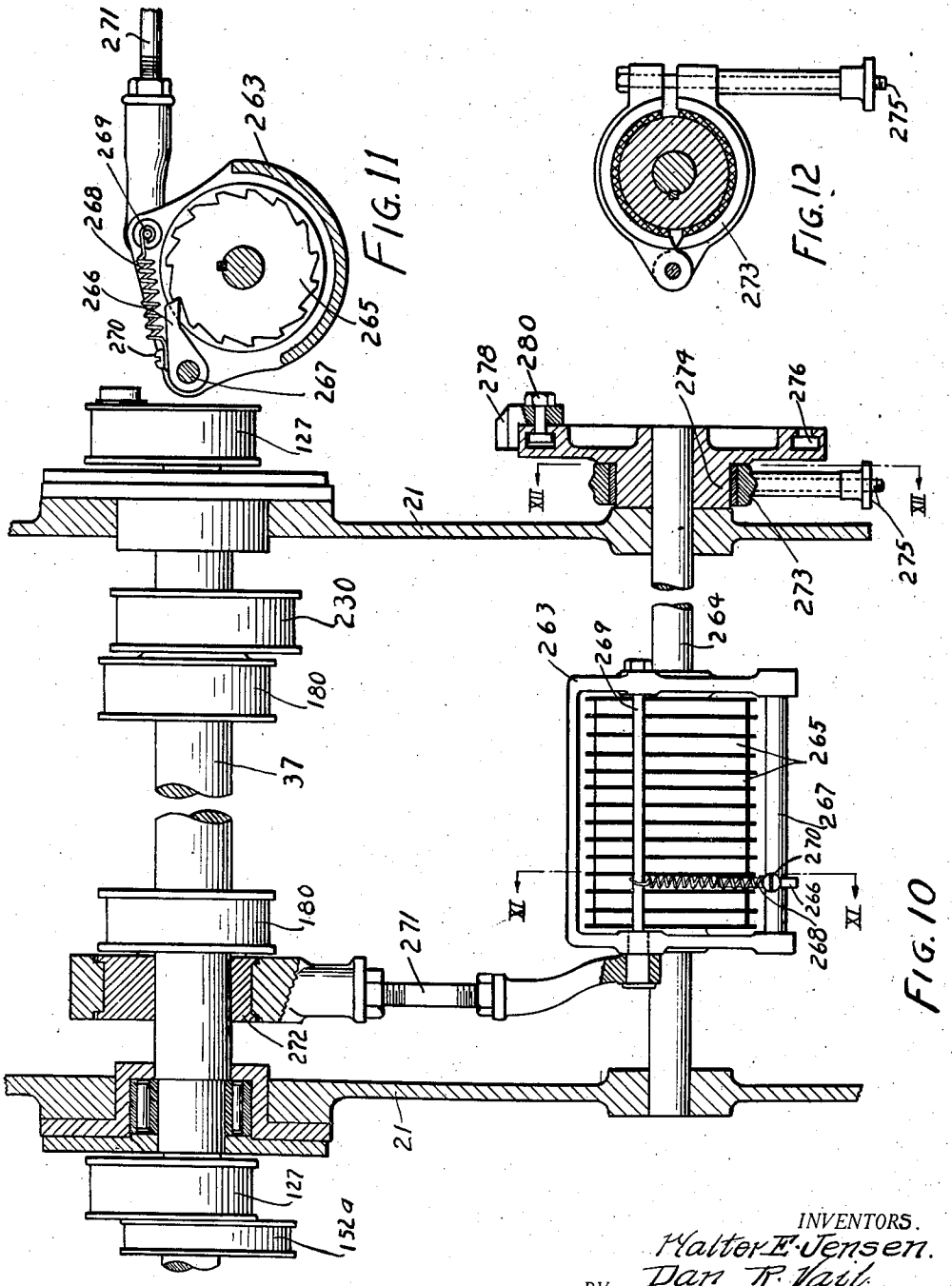


FIG. 11

FIG. 12

FIG. 10

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CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 11

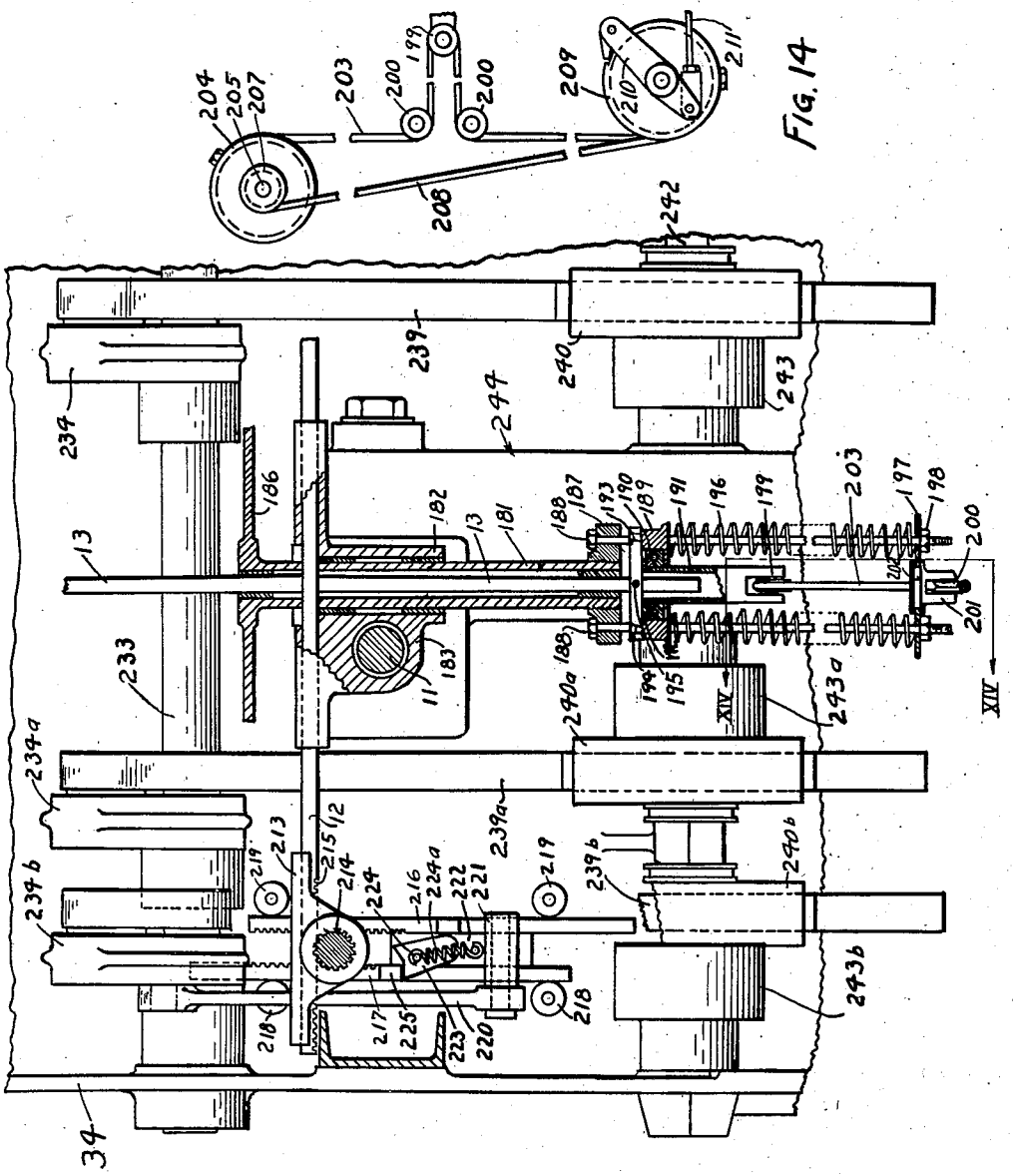


FIG. 14

FIG. 13

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Sept. 14, 1937. W. E. JENSEN ET AL 2,092,760

CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 12

FIG. 15

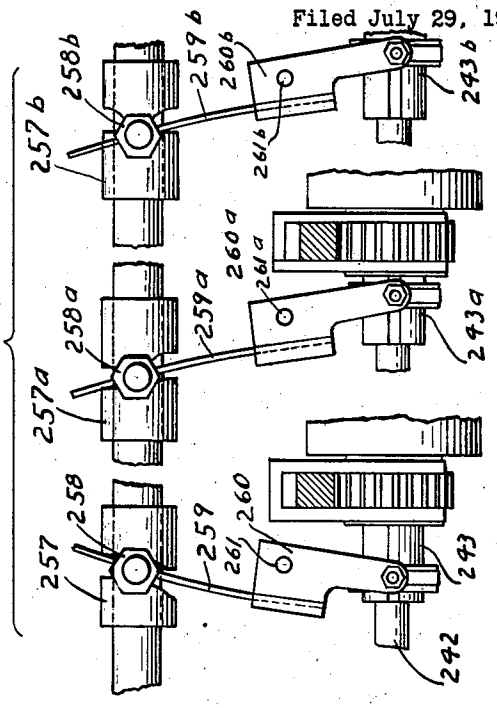


FIG. 16

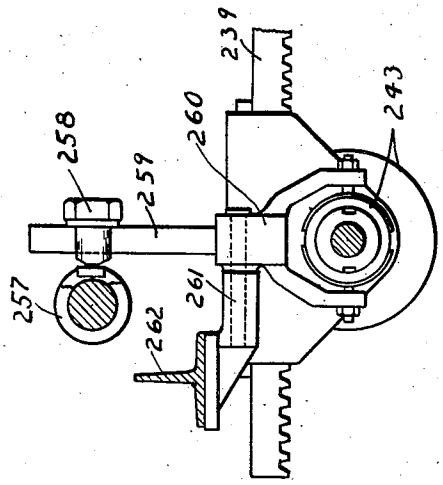
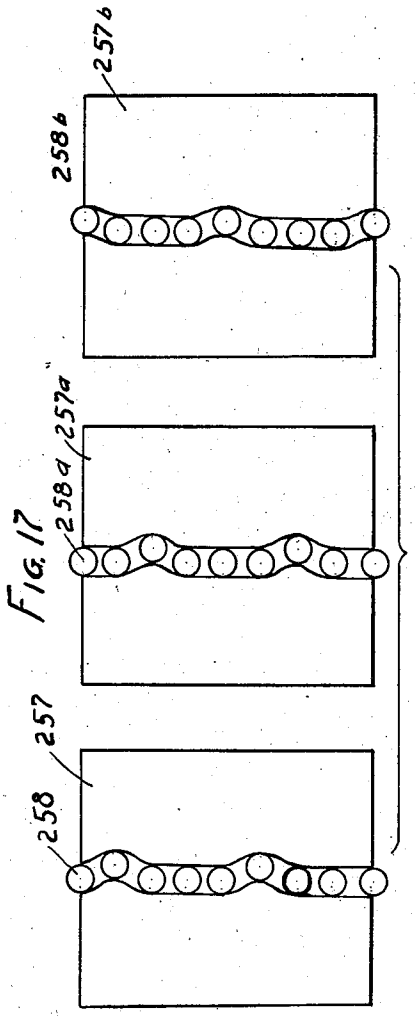


FIG. 17



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CELL CASE MACHINE

Filed July 29, 1935 13 Sheets-Sheet 13

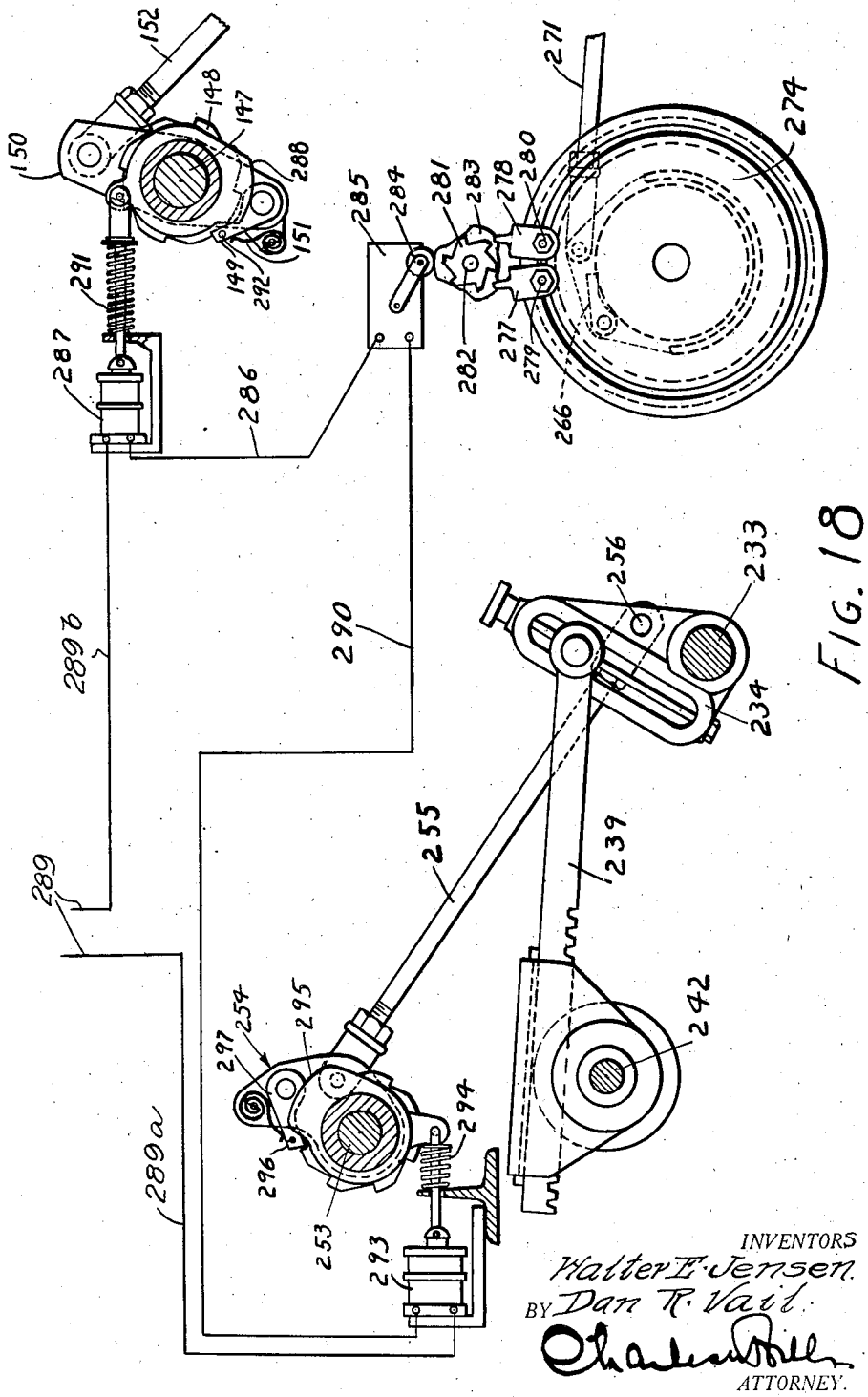


FIG. 18

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Patented Sept. 14, 1937

2,092,760

UNITED STATES PATENT OFFICE

2,092,760

CELL CASE MACHINE

Walter E. Jensen, Chicago, and Dan R. Vail, Evanston, Ill., assignors to Paper Partitions, Inc., Chicago, Ill., a corporation of Illinois

Application July 29, 1935, Serial No. 33,640

43 Claims. (Cl. 93—37)

This invention relates to a machine for punching, cutting and interlocking together strips of paper or paper-like material to form cell cases.

More specifically, this invention relates to machines which are adapted to automatically form cell cases throughout a wide range of sizes, and particularly adapted to make cell cases from heavy board-like paper material.

It is an object of this invention to provide a machine for making cell cases from paper of any caliper without bending or damaging the paper.

A further object is to provide a compact machine for manufacturing cell cases of various sizes from paper board material.

Another object of this invention is to provide a cell case machine having a single assembly rack that can be adjusted to assemble cases of widely varying sizes.

A still further object of this invention is to provide a machine of a highly flexible nature to manufacture cell cases in which the strips forming the cases may vary throughout a wide range in number, spacing, height and width.

A further object of this invention is to provide a machine for making cell cases from stiff board-like material.

A specific object of this invention is to provide a machine for making cell cases sufficiently stiff and heavy to replace the wooden partitions commonly used in beer cases and the like for separating large size bottles.

Other and further objects of this invention will become apparent from the following detailed description of the annexed sheets of drawings which form a part of this specification. It should be understood, however, that the drawings merely disclose a preferred embodiment of the invention and that equivalents, modifications and the like variations from the drawings are within the scope of this invention.

On the drawings:

Figure 1 is a top plan view, with a part broken away, of a machine embodying the principles of this invention.

Figure 2 is a side elevational view of the machine shown in Figure 1.

Figure 3 is an enlarged vertical section, with parts in elevation, taken substantially along the line III—III of Figure 1.

Figure 4 is an enlarged vertical section taken substantially along the line IV—IV of Figure 1 illustrating the top punch.

Figure 4*a* is a vertical section taken substantially along the line IV—IV of Figure 1 and illustrating the bottom or lower punch.

Figure 5 is an enlarged vertical section taken substantially along the line V—V of Figure 1.

Figure 6 is a perspective view illustrating the operation of the parts shown in Figures 4 and 5, and also illustrating the assembly rack.

Figure 7 is an enlarged vertical cross sectional view with parts in elevation, taken substantially along the line VII—VII of Figure 1.

Figure 7*a* is a horizontal cross sectional view taken substantially along the line VII*a*—VII*a* of Figure 7 and also showing the control device for rotating the assembly rack.

Figure 7*b* is a vertical cross sectional view taken substantially along the line VII*b*—VII*b* of Figure 7*a*.

Figure 8 is an enlarged side elevational view, with parts broken away and shown in cross section, illustrating part of the feed roll drive mechanism shown in Figure 2.

Figure 9 is an enlarged end elevational view of the feed roll drive mechanism illustrated in Figure 8.

Figure 10 is an enlarged horizontal cross section taken substantially along the line X—X of Figure 2 illustrating the indexing mechanism for varying the number of strips in the cell case being made.

Figure 11 is a cross sectional view taken substantially along the line XI—XI of Figure 10.

Figure 12 is a cross sectional view taken substantially along the line XII—XII of Figure 10.

Figure 13 is an enlarged horizontal cross sectional view taken substantially along the line XIII—XIII of Figure 2.

Figure 14 is a side elevational view taken substantially along the line XIV—XIV of Figure 13.

Figure 15 is an enlarged broken side elevational view of the clutches and control cams for elevating and lowering the assembly rack wherein the strips of the cell case are interlocked.

Figure 16 is an end elevational view of a clutch and cam shown in Figure 15.

Figure 17 is a development illustrating the operation of the cams shown in Figure 15, and

Figure 18 is a detailed view showing the electrical control mechanism for the clutches and feed roll, and illustrating how these mechanisms are united in an electrical circuit.

As shown on the drawings:

Operation of the machine

A general idea of the operation of the machine of this invention is illustrated in the perspective view shown in Figure 6. As shown therein, two webs A and B form a pair of super-imposed feed-

er trays (shown in elevation in Figure 2 and in detail in Figure 3) are directed respectively through superimposed punch presses 1 and 2 wherein they are provided with slots C and D respectively. These slots C and D have V-shaped ends to facilitate interlocking of the cell case strips. Two V's are formed in each slot merely because the forming punch can be more rigidly constructed with a double V male member. The V's in the web A open in an opposite direction than the V's on the web B so that the slots may be readily fitted into each other when assembling the cell case.

The punched web A is then directed under a drive roll 3 and the punched web B is directed over a drive roll 4. A smaller roll 5 is adapted to be alternately urged against the rolls 3 and 4, so that one web at a time is gripped by its drive roll and advanced through the nip of directing rolls 6 and 7, and through a cutting device 8 into holders 9 of an assembly rack 10. The cutting device 8 is then actuated to sever that portion of the web in the assembly rack from the web A to produce a strip E of the cell case being formed. The rack 10 is then raised by the lift screw 11 to place another pair of holders 9 in front of the cutting device 8 for receiving the next strip E therein. When the desired number of strips E have been seated in the rack, the rack is rotated through a 90° turn by a rack 12 to place the slots C of the now vertical strips E in alignment with the cutting device 8.

The roll 5 then shifts to grip the web B so that its drive roll 4 feeds the web through the cutting device 8 into the assembly rack. In this manner the slots C of the strips E receive the slots D of the web B in interlocking relation. The cutting device 8 then severs the seated portion of the web B to form a strip F of the cell case. The assembly rack is then lowered until the next series of slots C are opposite to the cutting device. Another strip F is then interlocked into these slots as indicated above.

When the desired number of strips F are seated in the holders (three are shown), the rack 10 and holders 9 are withdrawn through a stripper (shown in Figure 2) by the draw bar 13, and the cell case drops onto a conveyor 14 which moves the cell case out of the machine.

As will be hereinafter described, all of the moving parts of the machine are driven from a single drive shaft and timing mechanism is provided so that these parts will perform their respective functions at the proper time.

General outline of the machine

As shown in Figures 1 and 2, the general shape of the machine is rectangular and the various parts thereof are so arranged to provide a very compact structure. An open space 20 is provided intermediate the ends of the machine through which the conveyor belt 14 may travel to discharge the newly formed cell cases.

The main frame 21 of the machine carries at the right hand end thereof, as shown in Figures 1 and 2, a pair of bearing brackets 22 and 23 in which is mounted a vertical shaft 24 carrying bushings 25 and 26 abutting the brackets 22 and 23 respectively for preventing longitudinal movement of the shaft in the brackets. The shaft 24 supports at the top end thereof a frame structure 27 carrying a pair of feeder trays 28 and 29 in superimposed relation. The feeder trays serve to direct the webs of paper A and B from their respective rolls A' and B' (Figure 2) into the machine, and also serve to flatten out the paper.

The frame structure 27 also carries trimming devices hereinafter described for trimming the edges of the webs A and B. The trays and trimming devices are thus hinged to the main frame 21 and may be readily swung out of the line of the machine for adjustment and inspection.

The main frame 21 has slidable on the top thereof, near the center, a frame structure 32 carrying the punch presses 1 and 2. The main frame 21 also supports a frame structure 33 disposed in front of the frame 32. The frame 33 carries the feed rolls 3, 4 and 5, the guide rolls 6 and 7, and the cutting device 8.

An auxiliary main frame 34, somewhat lower than the frame 21, carries in spaced relation in front of the frame 21 to define the space 20, a pair of vertical standards 35 carrying a cross bar 36 for supporting the lift screw 11. The frame 34 also supports attendant mechanism, hereinafter described, for the operation of the assembly rack 10.

The drive for the machine comprises a main drive shaft 37 extending transversely through the main frame 21. The shaft 37 extends through the back end of the machine as shown in Fig. 1 and carries a drive pulley 38 connected to the shaft by a clutch 39. The clutch 39 is manually operated by the lever 40. A channelled beam member 41 bent into a U-shape and carried by the frame 21 serves as a support for the end of the shaft. The pulley 38, which also acts as a fly wheel is mounted within the U-shaped member as shown.

All parts of the machine, as will be hereinafter described, are driven from the drive shaft 37.

The feeder trays and edge trimming mechanism

As shown in Figures 1 and 2, the feeder trays 28 and 29 are carried by the frame 27 which is hinged to the right hand end of the machine. As best shown in Figure 3, this frame 27 has two pairs of laterally extending arms 42 and 43 supporting flat plates 44 and 45 respectively. Each plate 44 and 45 has side flanges 46 turned up at the edges thereof to define a tray.

The flanges 46 have slots 47 and 48 cut therethrough at opposite ends thereof. Rods 49 and 50 are freely mounted at their ends in the slots 47 and 48. The rods 49 and 50 extend across the width of the trays as shown at 50 in Figure 1 and have a top plate member 51 welded thereon flush with the bottom thereof. The paper webs A and B are directed under the plates 51 over the plates 44 and 45. Since the rods are freely mounted in the slots 47 and 48, the plates 51 fall by their own weight against the webs and serve to flatten and iron out the webs.

To facilitate threading the web into the trays, the rods 49 and 50 may be raised in the slots 47 and 48 and dropped into the enlarged portions 47*a* and 48*a* thereof. The top plates are thus held in spaced relation from the bottom plates 44 and 45.

Each top plate 51 has a handle 52 (Figure 3) secured to the top thereof for lifting the plate from the bottom plate 44 when threading the web B thereover.

Each bottom plate 44 and 45 has slots 53 and 54 extending transversely thereacross in spaced relation from each other. A pair of angle members 55 and 56 are held on each bottom plate 44 and 45 by means of bolts extending therefrom

through the slots 53 and 54, and through cross bars 59 and 60 into wing nuts 61 and 62.

The angle members 55 and 56, as shown in Figure 1, have their vertical sides disposed toward each other, and thus serve to guide the edges of the webs A and B over the supporting plates 44 and 45. Since the bolts 57 and 58 extend through slots in the bottom plates 44 and 45, it is evident that the angle members may be positioned to engage the edges of webs of any width less than the width of the trays.

Each of the arms 42 and 43 of the frame 27 has formed thereon pairs of housings 63 and 64 (Figures 1 and 3) for receiving the ends of shafts 65 and 66 respectively. The shafts 65 and 66 extend in front of the trays 28 and 29 and are preferably not rotatable.

Snugly fitting over each shaft 65 and 66 are pairs of roller or ball bearing races 67 and 68 with the outer race rings thereof freely rotatable relative to the inner race rings which engage the shafts. The bearing races serve as top cutting means and may be manually moved along the shaft in alignment with the edges of the web to be trimmed.

Cutting wheels 69 and 70 for trimming the edges of the web are rotatably mounted below the shafts 65 and 66 respectively in yoked arms 71 and 72. These yoked arms 71 and 72 are pivotally mounted in other yoked members 73 and 74 having legs 75 and 76 extending laterally therefrom. The members 73 and 74 are keyed on shafts 77 and 78 rotatably mounted at their ends in the arms 43 and 44 of the frame 27.

Worm gears 79 and 80 (Figure 2) are mounted at one end of each shaft 77 and 78 for engaging worms 81 and 82 respectively operated by hand wheels 83 and 84. A rotation of the hand wheels rotates the shafts 77 and 78 to disengage the cutting wheels 69 and 70 from cutting operation. When the cutting wheels are so disengaged the yoked members 73 and 74 (Figure 3) may be slided along their shafts 77 and 78 to space the cutters along the shafts for cutting the web to the proper width. The key ways in the shafts 77 and 78 permit this sliding operation but lock the yoked members 73 and 74 against rotation relative thereto.

It is to be understood that two or more yoked members, each carrying a cutter, are mounted on each shaft 77 and 78.

The yoke arms 71 and 72 are also individually adjusted relative to each member 73 and 74. For this purpose bolts 85 and 86 are extended from the legs 75 and 76 of the members 73 and 74 and through the members 71 and 72 near the ends thereof. Coiled springs 87 and 88 are disposed around the bolts and held under proper compression by nuts 89 threaded on the bolts.

Spring controller cams 90 and 91 are disposed around the bolts 85 and 86 respectively above the nuts 89. These cams 90 and 91 are each provided with flanges 92 on opposite sides thereof. The flanges 92 are adapted to fit over the edges of the members 71 and 72 as shown on the member 72 or by rotation through a quarter turn are adapted to be disposed under the members 71 and 72 as shown on member 71. In this manner the coiled springs 87 and 88 are quickly released or compressed without readjusting the nuts 89. Any individual cutter wheel may thus be thrown out of contact from the web and held in spaced relation from its co-operating top bearing race by moving the cam to the position shown on member 71.

The proper degree of compression of the cutting wheels 69 and 70 against their co-operating bearing races 67 and 68 is produced by adjusting the nuts 89 to compress the coiled springs.

It is evident from the above description that the webs to be trimmed pass through the nip of the cutter wheels and their co-operating top bearing races and are thus trimmed by the cutting wheels. Since both the cutting wheel and its cooperating top bearing race are freely rotatable, the same may be driven by merely pulling the web therebetween as it is drawn into the machine.

The punch press mechanism

As pointed out in the description of Figure 6, the webs from the trimmers are next each directed through a punch press indicated generally at 1 and 2. As best shown in Figures 1 and 2 these presses are mounted in a frame 32 carried on top of the main frame of the machine in tracks 93. The frame 32 is moved along the tracks by rotating a hand wheel 94 which turns the shaft 95 carrying gears 96 and 97 enmeshed with toothed racks 98 and 99 respectively. These racks are secured on top of the main frame 21.

As best shown in Figures 1 and 4, the frame 32 supports a pair of top cross beams 100 and 101 to which are bolted the female die member 102 of the press 1. The frame 32 also supports lower cross beams 103 and 104 in offset relation to the top pair of beams as shown in Figure 4a. The lower beams 103 and 104 have bolted thereon the female die member 105 of the press 2. These female die members are stationary.

The male members of the presses 1 and 2 are bolted to reciprocating angle beams 106 and 107 (Figures 4 and 4a), which beams are secured at their ends to housing members 108 and 109 (Figures 1 and 2). The housing members are slidable on vertical shafts 110 carried by the frame 32 on each side thereof.

The horizontal legs of each angle beam 106 and 107 are provided with two slots 111 and 112 extending thereacross as shown in Figure 1. Bolts 113 are inserted through the slots 111 to secure a plurality of chucks 114 (Figure 4) in proper spaced relation to the angle beams 106 and 107. Any number of chucks 114 may be used and spaced where desired along the slot 111.

The chucks 114 carry the slot cutting knives 115. These knives 115 are disposed at an angle as shown in Figures 4 and 4a and slide within the chucks. The knives 115 are provided with teeth 116 along their top edges which mesh with toothed rods 117 disposed through each of the chucks 114 across the width of the die. The rotation of a rod 117 therefore adjusts the knives to cut a slot of the desired length in the web since the knives are angularly disposed in the chucks and may thus be raised out of full cutting contact with the web.

The slots 112 have bolts 118 extending therethrough to secure the V forming punches 119 to the angle members 106 and 107. These punches 119 are provided with slots for receiving the knives 115 therethrough as shown in Figures 4 and 4a.

The female die members 102 and 105 are provided with apertures for receiving the knives and punches and the webs A and B passing through the punch presses are, therefore, provided with the V-shaped slots C and D (Figure 6) as the male die is moved into the female die.

To prevent the webs from adhering to the male

member as it is raised, stripping bands 120 are provided around each male die as shown. These bands carry brackets 121 and 122 on their ends. The brackets are supported by and slidable along rods 123 and 124 respectively. The rods are secured at their ends to a stationary part of the frame 32.

The brackets 122 receive therethrough vertical guide rods 125 carried by the chucks 114. These rods 125 slide freely back and forth through the brackets 122 but serve to align the stripping bands 120 with the male dies when the same are reset relative to the beams 106 and 107.

The male members of the punch presses are driven simultaneously through link arms 126 (Figures 1 and 2) connected with the housing members 108 and 109. The link arms are driven by eccentrics 127 mounted on the drive shaft 37 on both sides of the machine. The housing members 108 and 109 are connected to the link arms 126 through cross heads 126*a* which slide in a groove formed in the face of the housing members 108 and 109 as shown in Figure 2. The cross heads 126*a* are secured to rods 126*b* (Figure 2) which are fastened at their other ends to the frame 33 through springs (not shown). In this manner the frame 32 supporting the punch presses may be slid along the main frame 21 without changing the vertical alignment of the link 126. The cross heads 126*a* are locked in the members 108 and 109 when the machine is operating.

The feed roll mechanism

From the punch presses the webs A and B are directed through the feed roll mechanism carried by the frame 33 (Figures 1 and 2).

This mechanism, best shown in Figure 5, comprises the two feed rolls 3 and 4 and the smaller gripping roll 5 described above in connection with Figure 6.

The feed rolls 3 and 4 are driven simultaneously but intermittently by a rack arm 128 through a train of gears 129, 131 and 132 (Figures 1 and 2). The gear 129 meshes with the rack 128 and drives a roller clutch 130 carried by the frame 33. The clutch 130 has a gear meshing with the gear 131 which is keyed to the shaft of the feed roll 3. The clutch 130 also drives another idler gear 132 carried by the frame 33. The idler gear 132 drives the gear 133 which is keyed to the shaft of the feed roller 4. As the rack 128 is reciprocated on the drive stroke, the clutch 130 is engaged to drive the feed rolls 3 and 4 through the train of gears described above. On the return stroke the rack 128 rides idle because the clutch 130 engages in one direction only.

The rack 128 is reciprocated through a lost motion device 134 best shown in Figures 8 and 9. The device 134 is pivoted to the main frame 21 at 135 and driven by a cam bearing 136. The cam 136 is carried by the eccentric disc 127 driven by the shaft 37. The shaft 37 terminates flush with the outside face of the eccentric 127.

As the drive shaft 37 rotates, it drives the eccentric 127 thus also moving the cam 136 to oscillate the lost motion device 134. The cam 136 is mounted in a slot 137 cut out in the back face of the device 134. The cam rolls in this slot 137 as it is driven toward and away from the pivot 135, but at the same time serves to oscillate the device 134.

The front face of the device 134 is provided with a dovetailed groove 138. A block 139 is dovetailed into the groove and carries a pinion gear 140 enmeshed with teeth 141 formed in the groove 138. A knurled knob 142 is provided for manually rotating the gear 140 for setting the block 139 in adjusted position in the groove. The adjusted block is then locked by one of the set screws 143 (Figure 8). The amount of movement of the rack is thus controlled by adjusting the block 139 in the lost motion device 134. The amount of rotation of the feed rolls 3 and 4 can thus be accurately set.

While the feed rolls 3 and 4 are directly mounted in the frame 33, the gripping roll 5, however, is carried in supports 144 which are keyed to a shaft 145. The shaft 145 is mounted at its ends on the frame 33 as shown in Figure 1. As shown in Figure 5, a cam 146 is keyed to a shaft 147 mounted below the shaft 145 in the frame 33. The shaft 147, as shown in Figure 1, extends through the frame 33 at the back side of the machine and is secured to a ratchet gear 148 (better illustrated in Figure 18). A pawl 149 (Figure 18) on a support 150 is urged into engagement with the teeth of the ratchet gear by a spring 151. The pawl support 150 is oscillated by a link rod 152 mounted on an eccentric disc 152*a* eccentrically secured on the drive shaft 37 (Figures 1 and 10).

A wheel or roller 153 (Figure 5) carried by a member 154 rides the cam 146 and is held thereagainst by a tension spring 155 secured at one end to the frame 33 and at the other end to the member 154. The member 154 has a T-shaped portion 156 pivoted at the center thereof in a bell crank 157 carried by the member 144.

Coiled springs 158 and 159 are held under compression between the T portions 156 of the member 154 and laterally extending arms of the member 144. When the wheel 153 rides the low portions of the cam 146 as shown in Figure 5, the member 154 urges the gripping roll 5 against the feed roller 3 so that the feed roller will pull the web A. However, when the wheel 153 rides the high portions of the cam 146, the member 154 is moved outwardly to force the crank 157 outwardly and unbalance the coiled springs 158 and 159. The springs then snap the roller 5 downwardly against the feed roller 4 so that it will pull the web B.

The webs A and B are then directed over a wedge shaped plate 160 through the nip of the guide rolls 6 and 7.

The member 144 has an extension 161 thereon provided at its end with a boss 162. The boss 162 is pinned to a vertical rod 163 carrying plates 164 and 165 which are disposed over the wedge shaped plate 160.

The web A passes under the plate 165 while the web B passes over the plate 164. When the boss 162 is raised, the coiled springs 167 and 168 disposed around the rod 163 are compressed thereby raising the plate 165 from the web A and urging the plate 164 against the wedge plate 160 thus clamping the web B. The web A can then pass freely through the rolls 6 and 7, but the web B cannot move.

However, when the boss 162 is lowered, springs 166 and 169, also disposed around the rod 163, as shown, are compressed, while the springs 167 and 168 are expanded. The compressed springs move the plate 164 away from the web B and clamp the plate 165 against the web A. This device acts as a braking mechanism for the webs to stop their movement as soon as the gripping roll is disengaged from their respective driving rolls.

From the above description, it is evident that the link arm 128 drives the feed roll 3 in a clockwise direction and at the same time drives the feed roll 4 in a counter-clockwise direction for pulling the webs A and B through the feeder trays and the punch presses and feeding the punched webs through the cutter 8 (Figure 5) into the assembly rack 10. The rolls are driven intermittently, however, only when the punches are open and when the assembly rack is positioned to receive the web.

Since the gripping roll 5 can only be urged against one feed roll at a time, only one web at a time is moved, although both the feed rolls 3 and 4 rotate simultaneously. As will be more fully hereinafter described, the gripping roll 5 is shifted by the cam 146 and attendant mechanism when the assembly rack is shifted to receive strips from the web B. This usually is after the desired number of strips from the web A have been seated in the assembly rack.

The cutting mechanism

After the paper webs A and B pass through the nips of the guide rolls 6 and 7, they are directed between spaced horizontal plates 170 and 171 (Figure 5) to the cutting mechanism indicated generally by the reference numeral 8.

The cutting mechanism 8 comprises a stationary block 172 mounted in the frame 33 near the top thereof. The block 172 carries a stationary knife 173 which may be adjusted by means of a set screw 174 so that the knife edge thereof contacts the top surface of a web.

The frame 33 also carries a slidable support 175 disposed at right angles to the block 172. The support 175 carries the lower knife 176 which is adjustable therein by means of a set screw 177. The support 175 is pivotally connected at 178 to a driving rod 179. It should be understood that while only one rod 179 is shown, however, a similar rod is disposed at the other end of the support 175 in an identical manner. The rods 179 are reciprocated by the main drive shaft 37, by eccentrics 180 keyed to the shaft (Figure 10).

When one of the webs A or B is properly seated in the assembly rack 10, the cutting knife 176 is actuated to cut off the seated portion of the web to form a cell case strip. The operation of the cutting knife 176 is properly timed so that the cutting action occurs only when the strip forming portions of the web are properly seated in the assembly rack.

The assembly rack mechanism

As best shown in Figures 2 and 6, the assembly rack 10 carries the holders 9 for receiving the strip E. The rack 10 is carried by a draw bar 13 mounted in a boss 181 which boss in turn is rotatably mounted in a boss 182 of an elevating member 183. The elevating member is in threaded relation on the lift screw 11.

The lift screw 11, as shown in Figure 7, is rotatably mounted at the bottom in a gear box 244 and is supported at the top by a cross beam 36 carried by the vertical standards 35 (Figure 2) of the frame 34.

As shown in Figure 2 the holders 9 of the assembly rack 10 extend through a stripping cage 185 carried by a plate 186 mounted on the end of the boss 181. The holders 9 may be drawn through the cage 185 to strip the cell case therefrom by pulling the draw bar 13, carrying the rack 10, through the boss 181. The mechanism for this latter operation comprises a member 187 (Figure 13) threaded on the end of the boss 181 and having bolts 188 extending therefrom. A bearing cup 189, having a thrust bearing 190 therein, is slidable along the bolts 188 and disposed around a sleeve 191 having an outturned flange 192 engaging the top of the thrust bearing 190.

A cap 193 is disposed over the bearing cup 189 and secured thereon by means of screws 194. The cap 193 is pinned to the draw bar 13 by a pin 195.

The bolts 188 have disposed therearound coiled springs 196 abutting the bearing cup 189 at one end and flat circular washers 197 held by nuts 198 at the other end.

A pulley 199 is rotatably mounted on the end of the sleeve 191. A pair of pulleys 200 have a support 201 provided with a grooved circular base 202 engaging in rotatable relation the washers 197.

A chain or cable 203 is threaded over the pulleys 199 and 200 as shown in Figures 2 and 14 and is secured at one end to a relatively large drum 204 rotatably mounted on a shaft 205. The shaft 205 is supported by brackets 206 extending from the vertical standards 35.

A smaller drum 207 is integrally united with the large drum 204. A second chain or cable 208 is adapted to wrap around the small drum 207 while the cable 203 is adapted to wrap around the large drum 204. The cables 203 and 208 together wrap around a lower drum 209 driven by a ratchet device 210 which device is actuated by a link 211 connected indirectly to the main drive shaft 37.

A rotation of the driving drum 209 thus wraps the cable 208 therearound and unwraps the cable from the smaller drum 207 thereby rotating the larger drum 204 and wrapping the cable 203 therearound at a relatively high speed. At the same time the other end of the cable 203 is wrapped around the driving drum 209 and the pulley 199 is moved against the pressure of the springs 196 toward the pulley 200 thereby withdrawing the draw bar 13.

The thrust bearing arrangement permits a rotation of the boss 181 without rotating the pulleys 199 and 200. In other words the bolts 188 and springs 196 rotate with the boss 181, but the sleeve 191 therein does not rotate because of the thrust bearing 190. Since the draw bar 13 is pinned to the cap 193, the same is moved when the pulley 199 is moved toward the pulleys 200 through the sleeve 191 pulling the bearing cup 189 and the cap 193. The cable arrangement is necessary because the lift screw raises and lowers the assembly rack and the draw bar is only withdrawn at the end of the downward stroke to discharge the finished cell case. When the drum 209 is idle, the cable 203 permits raising and lowering of the assembly rack without disturbing the draw bar. The swivel mounting arrangement also permits a rotation of the assembly rack without interfering with the operation of the pulleys 199 and 200. This mechanism is all timed to operate and perform its respective functions in cooperation with the other mechanism by means hereinafter described.

It is evident from the above description that the lift screw raises and lowers the assembly rack 10, and the rack 12 rotates the boss 181 to turn the assembly rack through a 90° angle when the rack is at the top of its stroke. When the rack is at the bottom of its stroke, the draw bar 13 is moved to withdraw the assembly rack through

the stripping device to discharge the assembled cell case from the holders and simultaneously with this movement the rack is rotated back through an angle of 90° to return it to its initial alignment.

Mechanism for rotating the assembly rack

As shown in Figure 6, the rack **12** meshes with the gear **212** to rotate the boss **181** when the elevating member **183** is at its top point on the lift screw, and thus rotate the assembly rack **10** through a 90° turn.

The rack **12** is operated by mechanism best shown in Figures *7a*, *7b* and 13. As therein shown, the end of the rack **12** slides in the housing **213**. A vertical toothed rod **214** having teeth along its entire length slides through the housing **213** as shown. The teeth of the rod **214**, although in constant engagement with the teeth **215** of the rack **12**, are in vertical alignment with the teeth **215** and slide vertically thereon. The housing **213** may thus move up or down with the elevating housing **183** without actuating the draw bar **12**.

A pair of horizontally disposed racks **216** and **217** are slidably mounted on rollers **218** and **219** in spaced opposed relation and have teeth meshing with the teeth on the vertical rod **214** but also slidable relative thereto. A link arm **220**, oscillated by a member **234***b* (hereinafter described) which is keyed to an auxiliary rocking shaft **233**, has a laterally extending boss **221** rotatably mounted on the end thereof. The boss **221** carries a block **222** mounted between the racks **216** and **217**. A trip device **223**, operated by a cam mechanism hereinafter described, is pivotally carried on the block **222**. The trip carries a pin **224** on which is hooked a coiled spring **224***a* to hold the trip in place. Each of the racks **216** and **217** has an abutment **225** adapted to be engaged by the spring trip device **223**.

When the elevating housing **183** reaches the top of its travel, the trip device **223** is engaged with the abutment **225** of the rack **217**, and the link arm **220** drives the block **222** to slide the rack **217** ahead in the rollers **218**. This movement of the rack rotates the toothed rod **214** enmeshed therewith. The rotation of the rod **214** slides the rack **216** back along the rollers **219** and at the same time the rack **12** is moved to rotate the boss **181** through a 90° turn and thereby turn the assembly rack.

When the elevating housing **183** reaches its bottom position while the finished cell case is being stripped from the assembly rack, the trip device **223** is moved to engage the abutment **225** of the rack **216** to slide this rack ahead along the rollers **219** and rotate the rod **214** in the opposite direction. The boss **181** is thus rotated back 90° to its initial position to align the assembly rack **10** for assembly of a new cell case.

The trip **223**, as shown in Figures *7a* and *7b*, is actuated by a pointed finger **226** keyed to a rod **227** carried by a bracket **227***a* secured to the frame **34**. A spring metal strip **228** extends through a slot in the rod **227**. The strip **228** extends through a slot in a finger **229** riding in a slotted cam **229***a*. The cam is mounted on a cam shaft **253** located in the rear of the machine as will be described. When the shaft **253** rotates, the cam **229***a* moves the finger **229** to alternately move the strip from one side of the finger **226** to the other, thereby swinging this finger. As the driving link **220** moves the block **222** toward the rear of the machine the pin **224** strikes the finger and is directed toward the side in which the finger points to engage the trip **223** with the rack **216** or **217**. The cam **229***a* thereby controls the operation of the trip **223** and the assembly rack **10** is rotated 90° only when at the top and at the bottom of its stroke.

The lift screw driving mechanism

As shown in Figures 1, 7, *7a* and 13, the main drive shaft **37** has an eccentric disc **230** secured thereon to which is fastened a link arm **231**. The link arm is connected through a bell crank **232** to rock a shaft **233**.

Three adjusting members **234**, **234***a* and **234***b*, are keyed to the shaft **233** and spaced as shown in Figures 1 and 13.

As indicated in Figure 7, each member **234**, **234***a* and **234***b* comprises a slotted portion **235**, a bolt **236** extending therethrough, operated manually by a knurled knob **237**, and a boss member **238** carried by the bolt **236**.

Racks **239**, **239***a* and **239***b* are pivoted to the respective bosses **238** of the members **234**, **234***a* and **234***b*. These racks slide through saddles or housings **240**, **240***a* and **240***b* to drive small gears such as the gear **241**, rotatably mounted on a clutch shaft **242**. The shaft **242** carries roller cam clutches **243**, **243***a* and **243***b* (shown in detail in Figures 15 and 16).

The clutches **243**, **243***a* and **243***b*, when engaged, by mechanism hereinafter described, drive the shaft **242**.

Within a gear box **244**, through which the shaft **242** passes, a large gear **245** is mounted and keyed to the shaft **242**. The large gear **245** meshes with a small gear **246** keyed to a stub shaft **247** in the gear box **244**. A large gear **248** is driven by the stub shaft **247** and drives a spur gear **249**. The spur gear, in turn, drives the vertical supporting rod **250** through a pair of bevel gears **251**. The supporting rod **250** is connected, through a spring loaded slip clutch **252**, to the lift screw **11**. The function of the slip clutch will be hereinafter described.

Control mechanism for the clutches

At the rear of the machine, as shown in Figure 1, there is mounted a shaft **253** positioned above the clutch shaft **242**. This shaft is driven through a ratchet and pawl device **254** (better shown in Figure 18) by a link arm **255** pivotally connected at **256** to the adjusting member **234**. As described above, the adjusting member **234** is keyed on the shaft **233** and driven by the main drive shaft of the machine.

The rear shaft **253** carries three slotted cams **257**, **257***a* and **257***b*. Riding in the slots of the cams are fingers **258**, **258***a* and **258***b* respectively. These fingers, in turn, receive spring metal strips **259**, **259***a* and **259***b* (better shown in Figures 15 and 16).

The strips **259** are secured to yokes **260**, **260***a* and **260***b* respectively. The yokes are respectively pivoted, on pins **261**, **261***a* and **261***b*, carried by a cross beam **262** of the frame **34**. The male portion of the clutches **243**, **243***a* and **243***b* are actuated by these yokes.

As the cams **257**, **257***a* and **257***b* are rotated by the ratchet and pawl device **254** driving the cam shaft **253**, the spring strips are bent by the fingers riding in the slots to snap the clutches into and out of engagement to perform their function of driving the mechanism described above to rotate the lift screw in either direction at the proper speed. Three clutches instead of only two

are desirable. The third clutch serves as a correction factor making it possible to lose a stroke or to gain a stroke on the returning of the assembly rack to its initial position for receiving a new cell case therein as will be hereinafter described.

It is evident from the above description that the three adjusting members **234**, **234***a* and **234***b* drive the female portion of the clutches through the racks **239**, **239***a* and **239***b*. The cams on the cam shaft are made so that only one clutch will be engaged at a time to drive the clutch shaft **242**. For example, when the clutch **243** is engaged, the shaft **242** will be rotated in a direction to rotate the large gear **245** in the box **244** in such a manner so that the lift screw will be rotated for raising the assembly rack **10** thereon. The rack **239** driving this clutch **243** is so set that its driving stroke will rotate the clutch just the amount necessary to raise the assembly rack a desired degree for receiving the strip E of the cell case being formed. The amount of the driving stroke can be nicely adjusted by the members **234**. The rack **239**, on its return stroke, runs idle because, as pointed out above, the clutches drive in one direction only. During this idle stroke, a strip E is seated in the assembly rack. On the next drive stroke, the assembly rack is raised another desired amount to receive the next strip E.

When the assembly rack reaches the top of its stroke the clutch **239** is disengaged and, in fact, all of the clutches are disengaged at this point. The assembly rack is then rotated through 90°, the first strip F of the cell case is seated therein and the clutch **243***a* is then engaged to lower the assembly rack, step by step, in the same manner in which the clutch **243** raises the assembly rack. The clutch **243***a*, however, drives in the opposite direction to the clutch **243** on the return stroke of the rack **239***a* so that the lift screw rotates in the opposite direction than when the clutch **243** is engaged.

When the cell case in the assembly rack is completed, it is discharged as described above. The assembly rack is then rotated back through a 90° turn. During this rotation the third clutch is engaged for raising the assembly rack to its initial starting position for the assembly of a new cell case therein. This clutch is necessary to give high flexibility to the machine, and permits either a quick return or a slow return to the starting position depending upon the type of cell case being formed, so that when the clutch **243** is again engaged, it will start operation of the assembly rack from its initial starting position instead of below or above its starting position. It is evident that the number of strips in the cell case being formed and the size of these strips will vary the amount of correction necessary. The desired amount of correction is readily obtained by an adjustment of the adjusting member **234***b*.

The purpose of the slip clutch **252** is to serve as an overload slip means in the event that the assembly rack reaches its bottom position as determined by the stop collar **11***a* on the lift screw before the clutch **243***a* is disengaged. This slip clutch serves as a safety factor and merely permits slippage between the supporting member **250** and the lift screw **11**.

The indexing mechanism

The cam shaft **253**, as pointed out above, is rotated through the ratchet and pawl device **254** (Figure 18). Since, however, the machine is of a highly flexible nature adapted to form cell cases having different numbers of strips or ribbons therein, this device **254** and the ratchet and pawl device **150**, must be differently operated for each type of cell case to be made. As pointed out above, the ratchet and pawl device **150** rotates the cam shaft **147** which controls the position of the gripping roll **5**.

For the purpose of regulating the operation of the ratchet and pawl devices **150** and **254**, an indexing mechanism, best shown in Figure 10, is used.

This indexing mechanism comprises a basket or cage **263** rotatably mounted on a shaft **264** which shaft is, in turn, rotatably mounted in the main frame **21**. The cage **263** has a plurality of ratchet gears **265** mounted therein. All of the gears **265** are keyed to the shaft **264** and are thus adapted to rotate the shaft relative to the cage. Each succeeding gear **265**, however, has one more tooth than its predecessor.

A pawl **266** is slidably mounted on a rod **267** carried by the cage **263** and held to engage the teeth of a gear **265** by a coiled spring **268**. This spring is anchored at one end on the pawl at **270** and is hooked at its other end over a rod **269** carried by the cage. The rod **269** is in spaced parallel relation from the rod **267**. In this manner the pawl and spring may be moved manually along the rods **265** and **269** from one gear **265** to another gear to change the indexing of the machine.

The cage **263** is rocked on the shaft **264** through a link **271** by an eccentric disc **272** on the main drive shaft **37**. As the cage is rocked on the driving stroke, the pawl **266** engages a tooth of the gear **265** on which it is set. This gear then rotates the shaft **264** a distance equivalent to the length of the tooth on the gear **265**. On the return rocking stroke, the pawl slips over the gear to engage the next tooth thereon. To prevent an over-riding of the shaft **264** and to prevent a back-rotation thereof during this backstroke, a simple friction brake device **273** is mounted around a flanged boss **274** keyed to the end of the shaft **264** outside of the main frame **21**. The desired amount of friction can be maintained by a manual setting of the clamping screw **275** on the brake device.

The flange of the boss **274** is provided with a groove **276** that is T-shaped in cross-section as shown. This groove extends around the periphery of the flange on the boss. Contact members **277** and **278** (Figure 18) are bolted onto the flange by bolts **279** and **280** having their heads seated in the groove **276**. As is evident, these contact members may be properly spaced around the periphery of the flange on the boss **274** by loosening the bolts **279** and **280**. The number of pairs of contact members **277** and **278** used depend upon the nature of the cell case being formed. The condition of the current must be changed twice for completion of a cell case. If a cell case being formed is completed in less than one revolution of the member **274**, other pairs of contact members must be secured to this member.

As shown in Figures 2 and 18, the contact members **277** and **278** strike against a star-shaped wheel **281** rotatably mounted on a pin **282** carried by the main frame **21**. The wheel **281** carries a cam **283** for actuating a switch lever **284** of a switch **285** (Figure 18). The switch **285** is electrically connected therough a wire **286** to a solenoid **287** and through a wire **290** to a solenoid **293**.

The solenoid 287 operates a cam 288 freely carried adjacent the ratchet gear 148 on the shaft 147.

When the lever 284 of the switch 285 rides the high parts of the cam 283, the switch is closed and current flows from the main lines 289 through the wires 289a and 289b to the solenoids 287 and 293 and then through the wires 286 and 290 to the switch 285 which when closed completes the circuit to depress the cores of the solenoids 287 and 293 against the pressure of coiled springs 291 and 294. When the core of the solenoid 287 is depressed, the pawl 149 can engage the gear 148 to rotate the shaft 147 and shift the gripping roll through the mechanism described above. However, when the switch lever 284 rides the low parts of the cam 283 the switch 285 is opened to shut off the current to the solenoid 287. The spring 291 then expands to move the cam 288 so that the high portions thereon will contact the pin 292 carried by the pawl 149 and move the pawl out of engagement with the ratchet gear 148. The link 152 then cannot drive the shaft 147 and the position of the gripping roll 5 will not be changed.

The cam shaft 253 controlling the clutches is operated in an identical manner. Thus when the switch 285 is closed, the core of a solenoid 293 (Figure 18) is depressed against pressure of the coil spring 294 to move the cam 295 off of the pin 296 carried by the pawl 297 of the ratchet and pawl device 254. The pawl 297 is thus allowed to drive the ratchet gear for rotation of the cam shaft 253.

The proper timing for opening and closing the switch 285 is obtained by adjusting the contact members 277 and 278. At least one pair of contact points is necessary because the switch is closed for much less than one revolution of the boss 274. The rotation of this boss 274 is governed by the gears in the indexing cage 263 and as pointed out above, since each of these gears have one more tooth thereon than its predecessor, a sliding of the pawl 266 engaging these gears from one gear to another, will vary the rotation of the boss one degree thereby changing the indexing of the machine to feed one more or one less cell case strip into the assembly rack.

Summary of operation of machine

As indicated in Figure 2, two webs of paper A and B are pulled into the machine from rolls A' and B' respectively by the feed rolls. In the event that the rolls of paper are considerably large and heavy, it is desirable to drive these rolls by a belt and pulley connected to the main drive shaft of the machine, so that the feed rolls of the machine will not slip against the paper. Because the gripping roll only engages against one web at a time, it is evident that only one web is pulled into the machine at a time. The webs pass over the feeder trays 28 and 29 and are trimmed at the edges thereof by the trimming wheels to insure against the formation of cell case strips of uneven length.

In some operations it is possible to feed two strips into the assembly rack at one time and, for this purpose, a third trimming wheel may be provided to cut the web into two ribbons. When not in use, the third trimming roll may be disengaged from operation by the flanged lug device described in Figure 3.

From the trimmers, the webs A and B are directed through the punch presses where they are provided with the V-shaped slots. The punch press mechanism is slidable on the main frame so that it may be positioned at varying distances from the cutting mechanism 8. This adjustment is necessary so that the slots formed in the web will be cut by the cutting mechanism 8 directly along a line containing the widest point of the V's in the slots. It is evident that an even multiple of uncut strips must be disposed between the punches and the assembly rack. Because of the high flexibility of this machine permitting the manufacture of strips of any width, it is obvious that the punches must be moved relative to the cutting mechanism 8 so that such an even multiple of uncut strips may be threaded through the machine between the punches and the cutting mechanism.

The punches are driven at both ends through links 126 by eccentric discs 127 on the main drive shaft 37.

The feed rolls 3 and 4 are driven in one direction only to advance the webs A and B into the assembly rack. For this purpose a free wheeling clutch or roller clutch 130 driven by a reciprocating link 128 is provided. The link is driven from the main shaft 37 through a lost motion device 134 and the amount of movement of the link may be nicely adjusted by mechanism described in Figures 8 and 9.

The cutting mechanism 8 is also driven directly through links 179 by eccentric discs mounted on the main drive shaft.

As pointed out above, the assembly rack 10 must be raised a degree at a time to position the holders 9 thereon directly opposite to the cutting device for receiving the strips E therein. For this purpose the lift screw mechanism described above is provided. This mechanism is driven by a link 231 eccentrically connected to the main drive shaft. The link 231 rocks an auxiliary drive shaft 233 on which are mounted the adjustable connecting members 234. The members 234 drive three sets of roller or free wheeling clutches 243 through racks 239. The clutches are mounted on a clutch shaft 242 and are so controlled that the first clutch is engaged to raise the assembly rack through the lift screw mechanism. Since the clutches engage in one direction only, the return stroke of the racks 239 does not effect a raising of the assembly rack and during this stage of rest of the assembly rack the strips E are inserted therein.

When the assembly rack reaches the top of its stroke the clutch effecting its rising movement is disengaged, and the assembly rack is rotated through a 90° turn by mechanism described in Figures 7a, 7b and 13. The next clutch is then engaged to lower the assembly rack a step at a time for receiving the strips F of the cell case. These strips are interlocked with the strips E as pointed out above.

When the assembly rack reaches the bottom of its stroke, it is withdrawn through the stripper 185 by mechanism described in Figures 13 and 14 to discharge the cell case therefrom. During this movement it is preferable to begin the rotation of the assembly rack back to its initial position through the mechanism described in Figures 7a, 7b and 13, so that the cell case will fall free from the machine. The third clutch is then engaged to raise the assembly rack to its initial starting position. The function of this third clutch is to provide flexibility so that this return movement to initial starting position may be performed at a rate of speed necessary to correct for distance lost or gained on the lowering of the assembly

rack due to a desired uneven spacing of the strips. It is obvious that in some instances it may be desirous to form cell cases other than those having an equal number of strips E and F. For example, if it is desired to form rectangular cases containing more strips F than strips E, a different amount of return of the assembly rack to its starting position will be required than when the number of strips E exceed the number of strips F. This amount of return can be nicely adjusted through the third clutch and its attendant control mechanism.

The indexing of the machine to form cell cases having different numbers of strips is easily accomplished by shifting the pawl **266** from one gear to another in the indexing cage **263**. Since each succeeding gear has an additional tooth, a change in the indexing throws in one more or one less strip in the cell case being formed. The indexing mechanism, as pointed out above, controls the solenoid mechanism described in Figure 18 for operating the feed rolls and the clutches.

From the above description it is evident that the machine of this invention can be readily adjusted to form cell cases of widely different size, shape and number of partitions. Since the paper forming the cell cases is passed through the machine in almost a horizontal position, it is not bent or damaged. This machine, therefore, makes possible the formation of cell cases from papers of very heavy caliber which would normally be damaged by bending while passing through machines of other types.

We are aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and we, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

We claim:

1. A cell case machine comprising an assembly rack, holders carried by said rack for receiving strips that are to be assembled into cell cases, a device for feeding strips to said holders, mechanism for moving said rack and holders in front of said feed device to receive the strips therefrom, mechanism to rotate said rack and holders for receiving additional strips from the feed device at an angle to the other strips, a stripping device and means for withdrawing the assembly rack and holders through said stripping device to discharge the resulting cell case from the machine.

2. A cell case machine comprising an assembly rack, holders arranged in pairs projecting from said rack, means for adjusting the position of said holders on said assembly rack to receive the ends of punched strips therein, a punching device for punching slots in paper webs, mechanism for moving said webs into said holders, mechanism for cutting the portion of the web seated in the holders from the remaining portion of the web, mechanism for moving said rack and holders in front of said cutting mechanism to receive additional strips therefrom, mechanism for rotating said rack to receive additional strips from the cutters at an angle to the other strips seated in the holders on the rack, and mechanism for discharging the cell case from the machine.

3. A cell case machine comprising an assembly rack, pairs of holders projecting from said rack for receiving the ends of strips to be assembled into cell cases, a cutting device, means for feeding a web of paper through said cutting device into said holders, mechanism for driving the cutting device to sever the strips of paper seated in the holders from the web, means for moving the assembly rack and holders relative to the cutting device for receiving additional strips, mechanism for rotating said rack and holders, mechanism for feeding a second web of paper through said cutting device into interlocking relation with the seated strips on the assembly rack at an angle to said seated strips, and mechanism for discharging the resulting cell case from the holders.

4. A cell case machine comprising a pair of punch presses in superimposed relation, a cutting device, an assembly rack in front of the cutting device, mechanism for pulling a separate web of paper through each of said punch presses and for pushing the webs through the cutting device and into the assembly rack, means for shifting said mechanism to operate on only one web at a time, a single drive means for said punch presses and cutting device, mechanism for actuating the cutting device from said drive means when a portion of the web is seated into the assembly rack to sever said portion from the web, and mechanism for effecting relative movement between said assembly rack and the cutting device to seat other webs therein.

5. A cell case machine comprising a main frame, an auxiliary frame hinged to said main frame, a pair of feeder trays in superimposed relation on said auxiliary frame, trimming wheels disposed in front of said feeder trays for trimming webs of paper passing over the feeder trays, a punch press mechanism slidable on said main frame, a pair of punches in said mechanism in superimposed relation for receiving the webs from the feeder trays, a feed roll mechanism in front of said punches, means to actuate said mechanism to drive one web at a time through the punches, an assembly rack for receiving the punched webs and means to sever the portions of the web in the assembly rack from the remaining portion of the web.

6. In a cell case machine having a main frame structure, a punch press carried by said main frame, two pairs of punches carried by said punch press in superimposed relation, means for driving said pairs of punches simultaneously, means for pulling a separate web of paper between each pair of punches and a shift device for said means so that only one web is moved at a time.

7. In a cell case machine adapted to act upon two webs of paper to form the strips of cell cases, a feed roll mechanism comprising two feed rolls in spaced superimposed relation, a gripping roll mounted between said feed rolls, and a cam actuated mechanism to shift said gripping roll alternatively to grip one web at a time against its driving roll so that that web will be advanced through the machine while the other web remains stationary.

8. In a cell case machine adapted to act upon two separate webs of paper for forming strips of cell cases, a feed roll mechanism comprising a pair of drive rolls in superimposed spaced relation, means for directing the web between the rolls, means for driving said rolls simultaneously at pre-regulated intervals, a gripping roll mounted between the feed rolls, and a spring mechanism to snap said gripping roll alternatively against the drive rolls for driving one web at a time through the machine.

9. In a cell case machine adapted to form two

webs of paper into strips for cell cases, a feed roll mechanism comprising a pair of feed rolls in spaced superimposed relation, a wedge shaped plate between said feed rolls adapted to receive the webs thereon, plates disposed over each of the faces of the wedge shaped plate, means for releasing one of said plates and clamping the other of said plates against the wedge to free one of the webs and clamp the other web, and a gripping roll adapted to be shifted alternatively against the drive roll for driving the freed web through the machine.

10. In a cell case machine adapted to form two webs of paper into strips capable of being interlocked for producing cell cases, a feed roll mechanism comprising a pair of feed rolls in spaced superimposed relation, a wedge shaped plate disposed between said drive rolls for directing the webs together after passing over the drive rolls, plates disposed over both faces of said wedge shaped plate, a gripping roll between said drive rolls, a support for said gripping roll, a cam for moving said support to urge the gripping roll alternatively against each drive roll, an arm extending from said support, a vertical rod secured in said arm, springs disposed around said rod for mounting said plates thereon whereby a movement of said arm raises one of said plates from the wedge shaped plate and clamps the other plate thereagainst to free one of the webs and to clamp the other web against movement.

11. In a cell case machine, a single assembly rack for receiving strips of paper in interlocking relation to form cell cases, a mechanism for raising and lowering said assembly rack, a mechanism for rotating said assembly rack through a 90° turn at the top of its stroke and at the bottom of its stroke, and a mechanism for withdrawing the assembly rack to discharge the finished cell case.

12. In a cell case machine adapted to form two webs of paper into strips for cell cases, a single assembly rack, holders on said rack for receiving punched strips of paper from the machine, means for raising said rack relative to the machine to receive a plurality of such strips in spaced relation from each other, mechanism for rotating the rack through a 90° turn, mechanism for lowering the rack a degree at a time to receive additional strips from the machine in interlocking relation with the first mentioned strips, a stripping cage, means for withdrawing the assembly rack through the stripping cage at the bottom of its stroke to discharge the cell case from the machine, and mechanism for adjusting said raising, lowering and rotating mechanism to vary the movement of the rack for assembly of cell cases throughout a wide range of sizes.

13. In a cell case machine adapted to punch two webs of paper to form slots therein and to sever the punched web into cell case strips, a single assembly rack for receiving the punched strips, a vertical lift screw for supporting said rack, mechanism for rotating said lift screw to raise the rack, mechanism to rotate the rack through a 90° turn, and mechanism to rotate the lift screw for lowering the rack in its turned position.

14. In a cell case machine a single assembly rack, a support for said rack, a boss for receiving said support in slidable relation, means for raising and lowering said boss, means for rotating said boss through a 90° turn, and means for withdrawing said support through said boss.

15. A cell case machine comprising a single assembly rack, a plurality of clutch mechanisms for raising and lowering said assembly rack, mechanism to rotate said rack through a 90° turn and means connecting said mechanisms to a single drive shaft.

16. In a cell case machine, a main drive shaft, an eccentric disc mounted on said drive shaft, a shaft in spaced relation from said drive shaft, a cage freely rotatable on said shaft, a link connecting said cage with the eccentric disc, a plurality of ratchet gears in said cage, each of said gears having a different number of teeth thereon, means for securing said gears to the shaft, a pawl adapted to slide along said cage for engagement with any one of the gears therein whereby the rocking motion imparted to the cage is transmitted through the gear engaged by the pawl to rotate the shaft, and means associated with said shaft to operate mechanism for controlling the operation of the machine.

17. In a cell case machine having a main frame, a shaft freely mounted in said frame, a cage freely mounted on said shaft, means for reciprocating said cage, a plurality of ratchet gears in said cage, means for securing said gears to the shaft, a pawl carried by said cage, means for contacting the pawl with any one of said ratchet gears to rotate the shaft with the cage through said gear, and means keyed to said shaft for controlling the operation of the machine.

18. In a cell case machine, an indexing mechanism comprising a shaft rotatably mounted in the frame of the machine, a cage freely mounted on said shaft, a plurality of ratchet gears in said cage, means for securing said ratchet gears to the shaft, a rod carried by said cage, a pawl slidable on said rod and adapted to be positioned over any one of said gears, and a spring for urging said pawl into engagement with the gear over which it is set, whereby movement of the cage is imparted to the shaft through said gear, said gears in the cage each having a different number of teeth thereon for varying the amount of movement of the shaft.

19. A cell case machine comprising a feed roll mechanism, a single assembly rack for receiving webs of paper from the feed roll mechanism, mechanism for raising, lowering and rotating said assembly rack, a cam shaft for shifting said feed roll mechanism, a cam shaft for controlling the operation of said assembly rack mechanism, means for rotating said cam shaft, and an indexing mechanism to control said means.

20. A cell case machine comprising superimposed feeder trays for directing two webs of paper in superimposed relation into the machine, means in the trays for ironing out said webs, cutting wheels for trimming the edges of said webs, a punch press mechanism, two sets of punches in superimposed relation in said mechanism for receiving the webs to form slots therein, means for driving both sets of punches simultaneously, a pair of feed rolls in spaced superimposed relation in front of said punch press mechanism for feeding the webs through the machine, a gripping roll between the feed rolls, means for shifting the gripping roll into contact with a web to urge the web against a feed roll for pulling that web through the machine, an assembly rack for receiving the web, a knife for cutting the portion of the web in the assembly rack from the remaining portion of the web, mechanism for raising, lowering and rotating said rack to position it for receiving other portions of the web and for receiving portions of the other web in interlocking relation with the seated portions, an index-

ing mechanism for controlling the operation of said gripping roll shifting means and said assembly rack mechanism, and means for manually setting said indexing mechanism.

21. In a cell case machine, a single assembly rack for receiving punched strips from the machine, elevating mechanism for said rack, a stripping cage around said rack, a draw bar for supporting said rack, a sleeve secured to said draw-bar in freely rotatable relation, a slidable support for said sleeve, a pulley rotatable on the end of said sleeve, a cable trained around said pulley, and means for shortening said cable to pull the assembly rack through the stripping cage for discharging the cell case formed thereon.

22. In a cell case machine, a single assembly rack for receiving punched strips thereon from the machine, an elevating mechanism for said rack, a stripping cage around said rack, a draw bar for supporting said rack, a sleeve secured to the end of said draw bar in free rotatable relation, a pair of bolts for slidably supporting said sleeve, a pulley rotatable in the end of said sleeve, a pair of pulleys rotatably mounted on said support, a cable trained over said pulleys, drums for receiving the ends of said cable, said pulleys permitting the operation of said elevating mechanism without moving the draw bar, and means for rotating said drums to shorten the cable and pull the assembly rack through the stripping cage for discharging the cell case thereon.

23. In a cell case machine, an assembly rack for receiving punched strips from the machine for assembling the cell case, elevating mechanism for said assembly rack, a toothed rack for rotating said assembly rack through a 90° turn, a vertical toothed rod enmeshed with said rack, a pair of spaced horizontal racks enmeshed with said rod, a spring trip device adapted to engage said racks, means for shifting said trip device, mechanism controlling the shifting of said device whereby one of said horizontal racks are moved to drive the toothed rod in one direction for rotating the rack and the other of said horizontal racks are moved to drive the toothed rod in the other direction for returning the assembly rack to its initial position.

24. In a cell case machine, an assembly rack, means for raising and lowering said assembly rack and for rotating said rack through a 90° turn comprising a plurality of clutch mechanisms, a cam shaft for controlling the operation of said clutches, a ratchet and pawl device for driving said cam shaft, a solenoid mechanism for controlling the operation of said ratchet and pawl device, and an indexing mechanism for actuating said solenoid mechanism.

25. A cell case machine comprising a punch press mechanism, a feed roll mechanism, an assembly rack mechanism, a pair of solenoid mechanisms for controlling the operation of said feed roll mechanism and said assembly rack mechanism, and an indexing mechanism for controlling the operation of said solenoid mechanisms whereby said feed roll mechanism and said assembly rack mechanism will operate in proper timed relation to the operation of said punch press mechanism.

26. In a cell case machine, a pair of feeder trays in superimposed relation to receive webs of paper therein for passage into the machine, means associated with said trays to flatten out the webs, shafts extending transversely across the front of said trays, bearing races slidably mounted on said shafts, supporting shafts mounted below said trays, yoked members having laterally extending legs keyed to said shafts, said members being slidable along said shafts, arms pivoted in said yoked members, cutting wheels rotatably mounted on said arms beneath the bearing races, coiled springs between the legs of said yoked members and said arms to hold the cutting wheels in contact with the bearing races and means to compress said springs to move the cutting wheels away from the bearing races.

27. A cell case machine comprising mechanism for cutting slots in paper webs, means for supplying two webs of paper to said mechanism, means for feeding one of said webs at a time to said mechanism, a cutter for severing strips from said webs, an assembly rack for receiving said strips, means for raising, rotating and lowering said assembly rack in front of said cutter to receive strips therefrom to build up a cell case therein and means for discharging said cell case from said machine.

28. A cell case machine comprising mechanism for cutting slots in paper webs, means for supplying two webs of paper to said mechanism, means for pulling one of said webs at a time through said mechanism, an assembly rack for receiving slotted webs from said mechanism, a cutter for severing portions of the webs seated in said assembly rack from the remaining webs and means for raising, rotating and lowering said assembly rack in front of said cutter for receiving the web portions therefrom to build up a cell case therein.

29. In a cell case machine, a gear box having gears therein, a vertical screw rod extending from said gear box, a boss in threaded engagement with said screw rod, a shank extending through said boss at right angles thereto, an assembly rack carried by said shank, means on said assembly rack for holding cell case strips, means for rotating said shank for turning said assembly rack and means for actuating the gears in said gear box for rotating said screw rod to raise and lower the boss thereon and thereby raise and lower the assembly rack.

30. A cell case machine comprising a main frame, a feed roll and cutting mechanism mounted on top of said frame, an assembly rack mechanism in front of said cutting mechanism, a punch press mechanism including two pairs of superimposed punches slidably mounted on said frame behind said feed roll mechanism, a pair of superimposed feed trays and trimming devices pivoted to the end of said frame for supplying webs of paper through the machine and a single main drive shaft for actuating said mechanisms.

31. In a cell case machine for forming webs of paper into cell case strips, mechanism for trimming the webs comprising a shaft extending transversely of said machine, a gear keyed to said shaft, a worm engaging said gear, a hand-wheel for rotating said worm to rotate the shaft to any desired degree, a bellcrank slidably keyed on said shaft and having a laterally extending leg, an arm pivoted to said bellcrank, a cutting wheel rotatably mounted on said arm, a coiled spring compressed between said arm and said leg and means for compressing said spring to move the cutting wheel out of cutting engagement without rotating said shaft.

32. In a cell case machine a main drive shaft, a second shaft in spaced relation from said drive shaft, a cage freely rotatable on said second shaft, means driven by said drive shaft for rock-

ing said cage, a plurality of gears in said cage, each of said gears having a different number of teeth thereon, means for securing said gears to the second shaft, means for engaging any one of said gears with said cage whereby the rocking movement imparted to the cage is transferred through the engaged gear to rotate the second shaft a desired distance, contact points associated with said second shaft and a plurality of solenoids actuated through said contact points for controlling the timing of operation of the mechanisms of the cell case machine.

33. A cell case machine comprising an assembly rack for receiving strips that are to be assembled into cell cases, a punching device for punching slots in paper webs, mechanism for moving said webs into said assembly rack, mechanism for cutting the seated portion of said webs from the remaining portion of the webs to form cell case strips in said assembly rack, mechanism for raising, rotating and lowering said assembly rack in front of said cutting mechanism for receiving the strips therefrom to build up a cell case in the assembly rack and mechanism for discharging the resulting cell case from the machine.

34. In a cell case machine adapted to form two webs of paper into strips for cell cases, a feed roll mechanism comprising a pair of feed rolls in spaced relation, a plate between said feed rolls adapted to receive the webs thereon, plates disposed over each of the faces of said first mentioned plate, means for releasing one of said plates and clamping the other of said plates against the first mentioned plate to free one of the webs and clamp the other web and a gripping roll adapted to be shifted alternatively against the feed rolls for driving the freed web through the machine.

35. A cell case machine comprising an assembly rack for receiving strips that are to be assembled into cell cases, a device for feeding strips to said assembly rack, mechanism for moving said assembly rack in front of said feed device to receive the strips therefrom, mechanism to rotate said rack through an angle, mechanism for moving said rack back in front of the feed device in its rotated position for receiving other strips thereon in interlocking relation to the previously seated strips and means for discharging the resulting cell case from the rack.

36. A cell case machine comprising a pair of punch presses, a single cutting device, an assembly rack in front of the cutting device, mechanism for pulling a separate web of paper through each punch press and for pushing one of the punched webs at a time through the cutting device to be seated in the assembly rack, means for actuating the cutting device to sever the seated portion of the web from the remaining portion and mechanism for raising, rotating and lowering said assembly rack in front of the cutting device for seating other strips therein to build up a cell case.

37. A cell case machine adapted to form two webs of paper into cell cases comprising a pair of punch presses for forming mating slots in said webs, a feed device adapted to feed one of said webs at a time through a punch press, an assembly rack for receiving the slotted webs, means for severing that portion of the web seated on the assembly rack from the remaining web, means for moving said rack relative to the cutting device for receiving other strips thereon, means for rotating the rack through an angle after the desired number of strips have been seated, means for returning the rack in a plurality of steps in front of said cutting means for receiving strips from the other web in interlocking relation to the first seated strips and means for discharging the resulting cell case from the machine.

38. A cell case machine comprising a main frame structure, a punch press carried by the main frame, a feed device for feeding a web of paper through the punch press, a single assembly rack for receiving the punched web from the press, a cutter for severing a portion of the web seated in the rack from the remaining web portion to form a cell case strip therefrom, means for moving the rack relative to the cutter to receive a series of strips therefrom, means for rotating the rack when the last strip of the series is seated therein and means for returning the rack in its rotated position back in front of the cutter to receive another series of strips therefrom in interlocking relation to the first series of strips.

39. A cell case machine comprising a main frame, a punch press slidable on top of said frame, two pairs of punches in superimposed relation in said press, means for directing a separate web of paper between each pair of punches to be separately punched thereby with mating slots, a feed mechanism to alternately feed the webs through the machine, a cutting device receiving a pre-set length of a web from the feed mechanism, an assembly rack in front of the cutting device for holding said length, means for actuating the cutter to sever the length from the web, means for moving the rack in front of the cutter to receive a series of lengths therefrom, means for shifting the feed mechanism to feed the other web to the cutter, means for rotating the rack, and means for returning the rack in its rotated position back in front of the cutter to receive lengths of the other web therefrom in interlocking relation to the first seated lengths.

40. In a cell case machine a cutter, an assembly rack ahead of said cutter for receiving strips of paper therefrom, means for moving the rack relative to the cutter until a series of spaced parallel strips are seated in the rack, means for rotating the rack and means for returning the rack back to the cutter to receive a second series of strips therefrom in interlocking relation to the first seated series of strips.

41. A cell case machine comprising a slot cutting device adapted to cut spaced slots in a web of paper, a cutter for cutting the slotted web into cell case strips, a second slot cutting device adapted to cut spaced slots in a web of paper for mating with the slots in the cell case strips, a set of cell case strip holders in front of the cutter, means for moving the holders relative to the cutter to bring unfilled holders in alignment therewith for receiving cell case strips therefrom, means for rotating the set of holders, means for returning the cell case strips in the holders back in front of the cutter with their slots in alignment therewith for receiving therefrom the strips with the mating slots thereby building up a cell case in the holders and means for stripping the cell case from the holders.

42. A cell case machine comprising an assembly rack, a pair of punch presses in superimposed relation spaced from said assembly rack, said presses adapted to each receive a separate paper web therethrough, a feeding device between said rack and said presses to pull the separate webs of

paper alternately through their presses and to push a punched web from its press into the assembly rack and a single cutting device to sever that portion of whichever web is seated in the rack from the remaining portion of that web whereby one cutting device serves to cut both webs into cell case strips.

43. In a cell case machine, a frame structure, a drive shaft rotatably mounted therein, a feed roll mechanism, an assembly rack mechanism, a punch press mechanism, means for driving said mechanisms from said drive shaft, clutch means interposed between the driving means and each of the mechanisms, an indexing device driven by the drive shaft and means for positively setting the device to vary the time of operation of said mechanisms for controlling the timing of the machine so that the various mechanisms can start to operate at different times irrespective of the rotation of the drive shaft.

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