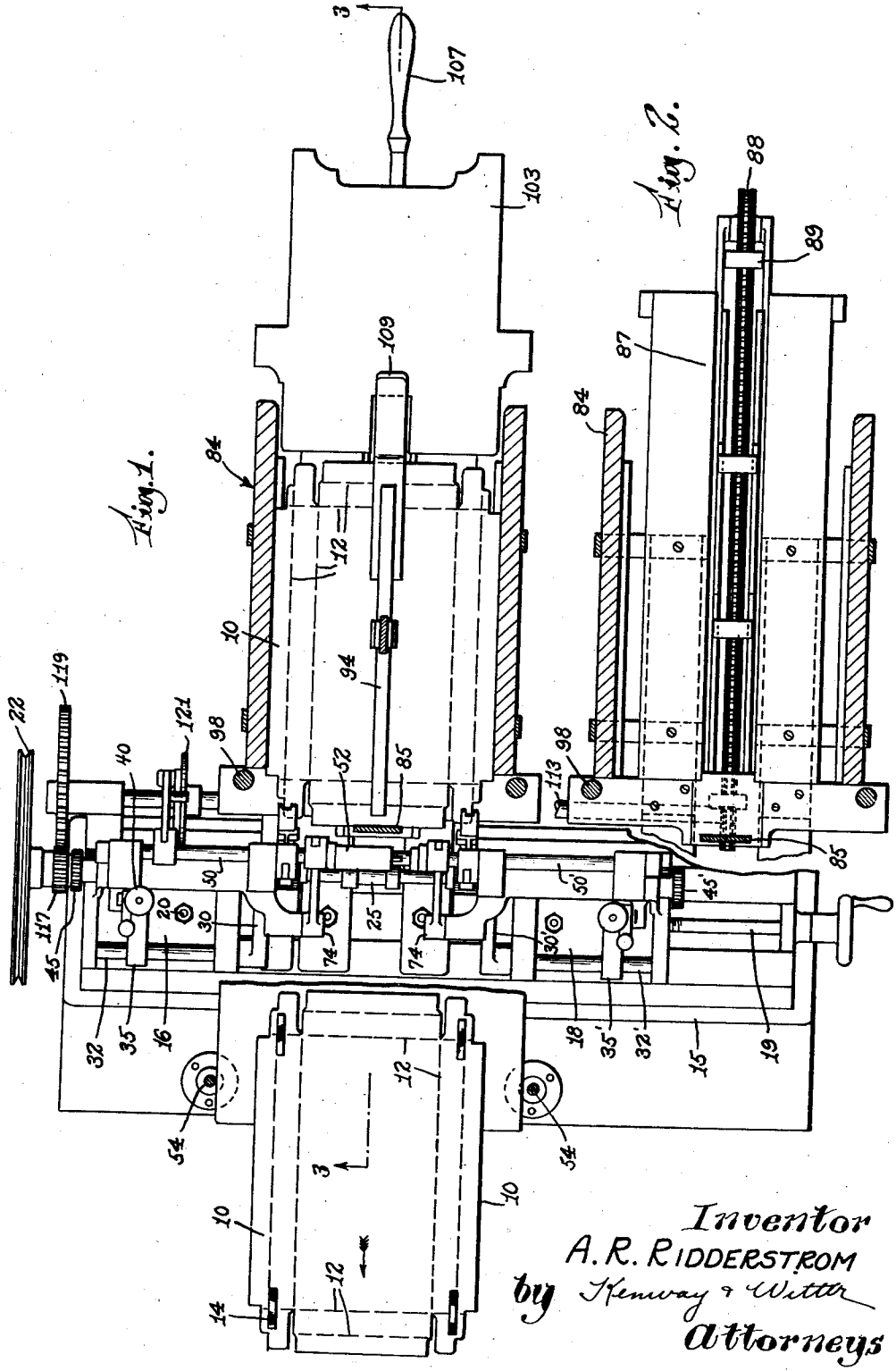
Oct. 10, 1939. A. R. RIDDERSTROM 2,175,618

TAPE-APPLYING MACHINE

Filed June 16, 1938 5 Sheets-Sheet 1

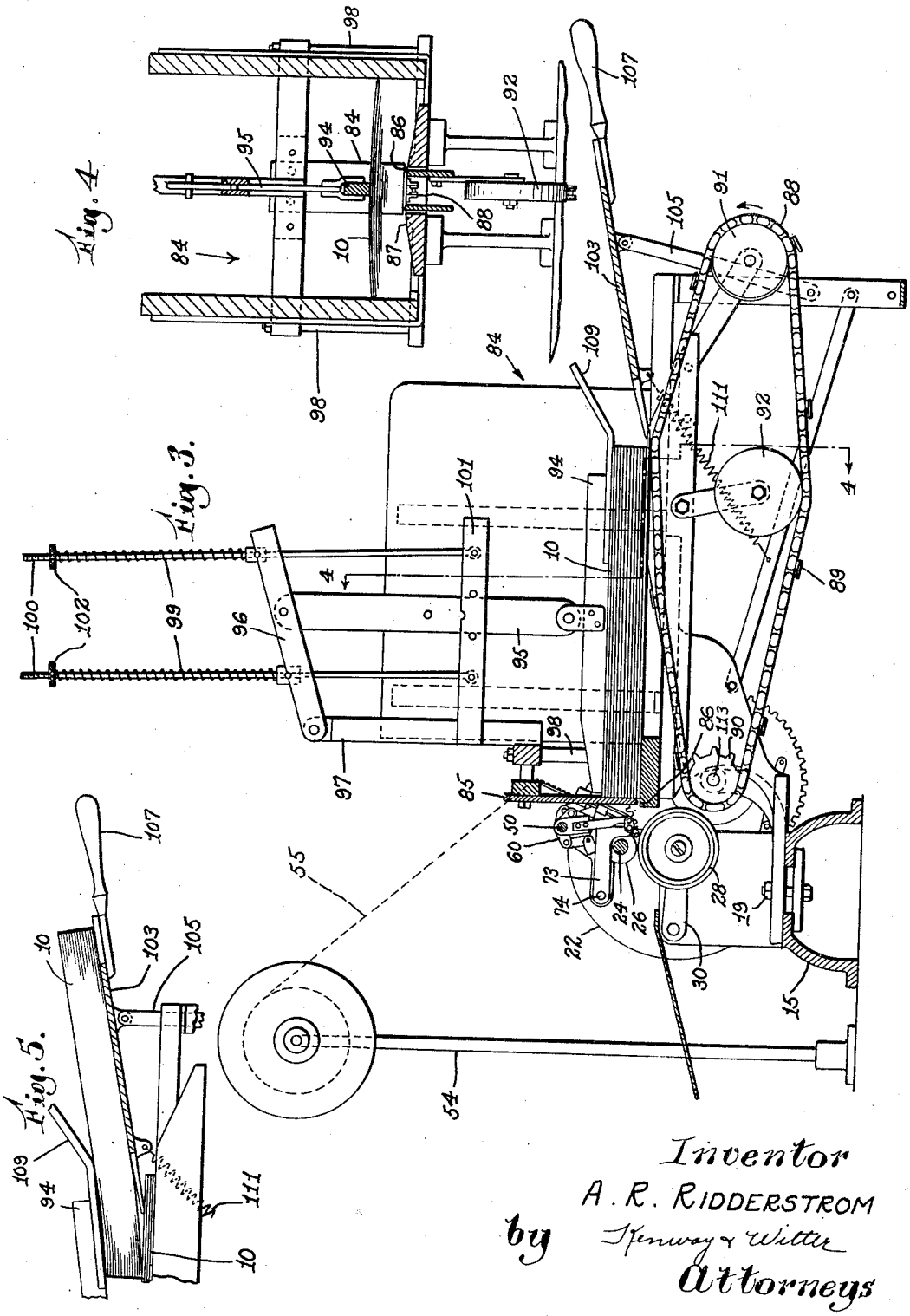


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TAPE-APPLYING MACHINE

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TAPE-APPLYING MACHINE

Filed June 16, 1938 5 Sheets-Sheet 3

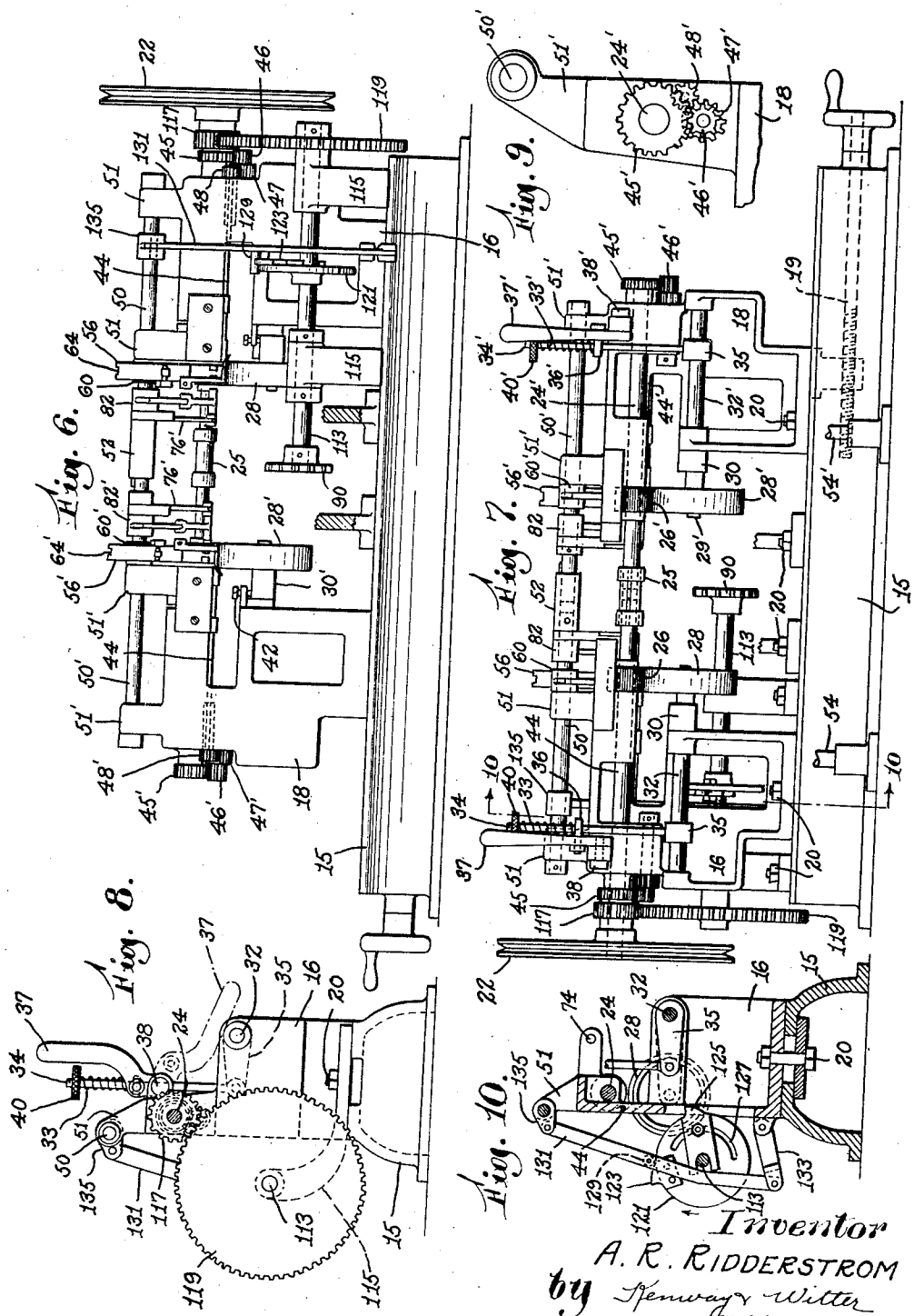


Fig. 6.

Fig. 9.

Fig. 7.

Fig. 8.

Fig. 10.

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TAPE-APPLYING MACHINE

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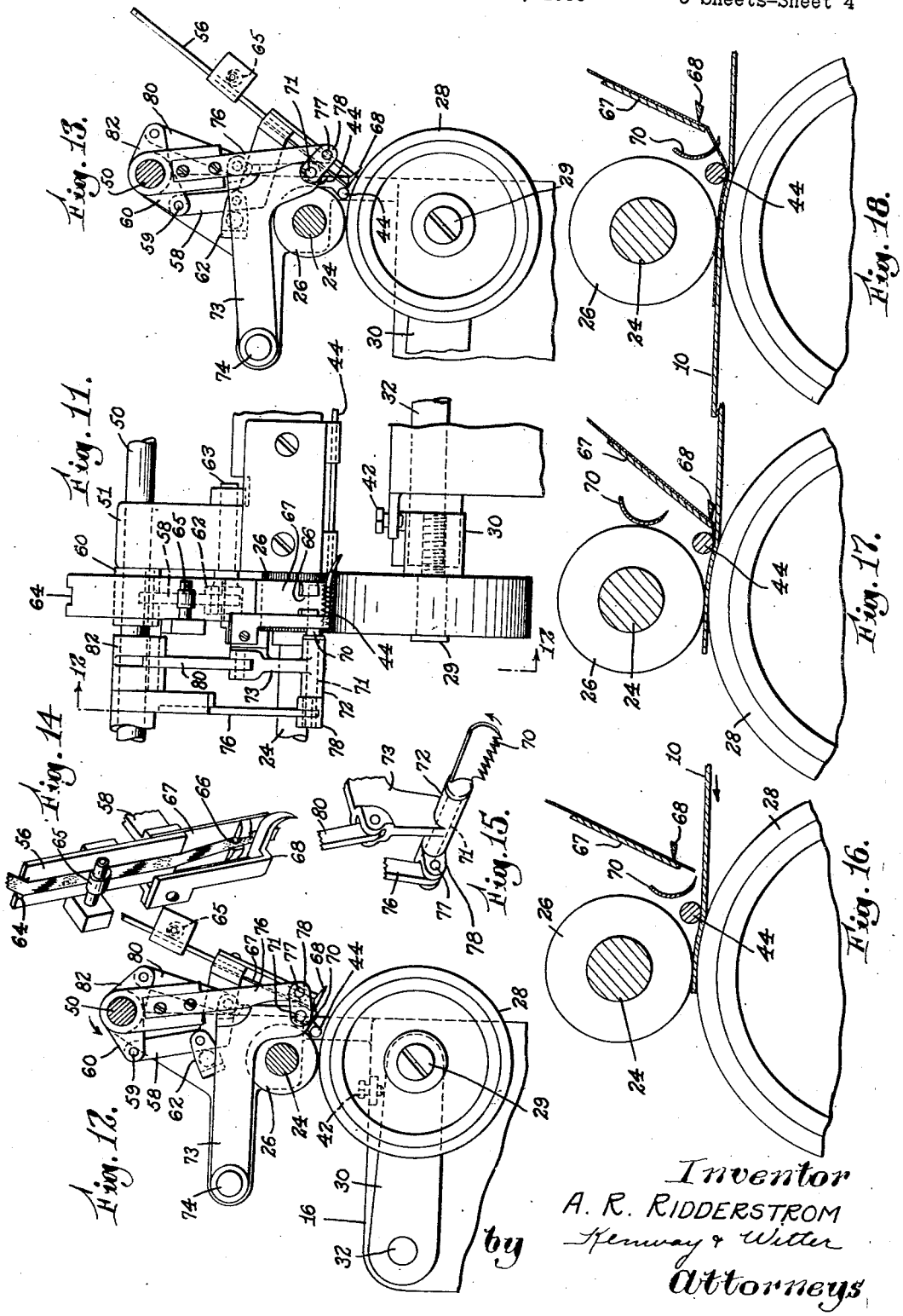


Fig. 13.

Fig. 18.

Fig. 11.

Fig. 17.

Fig. 14

Fig. 15.

Fig. 16.

Fig. 12.

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TAPE-APPLYING MACHINE

Filed June 16, 1938 5 Sheets-Sheet 5

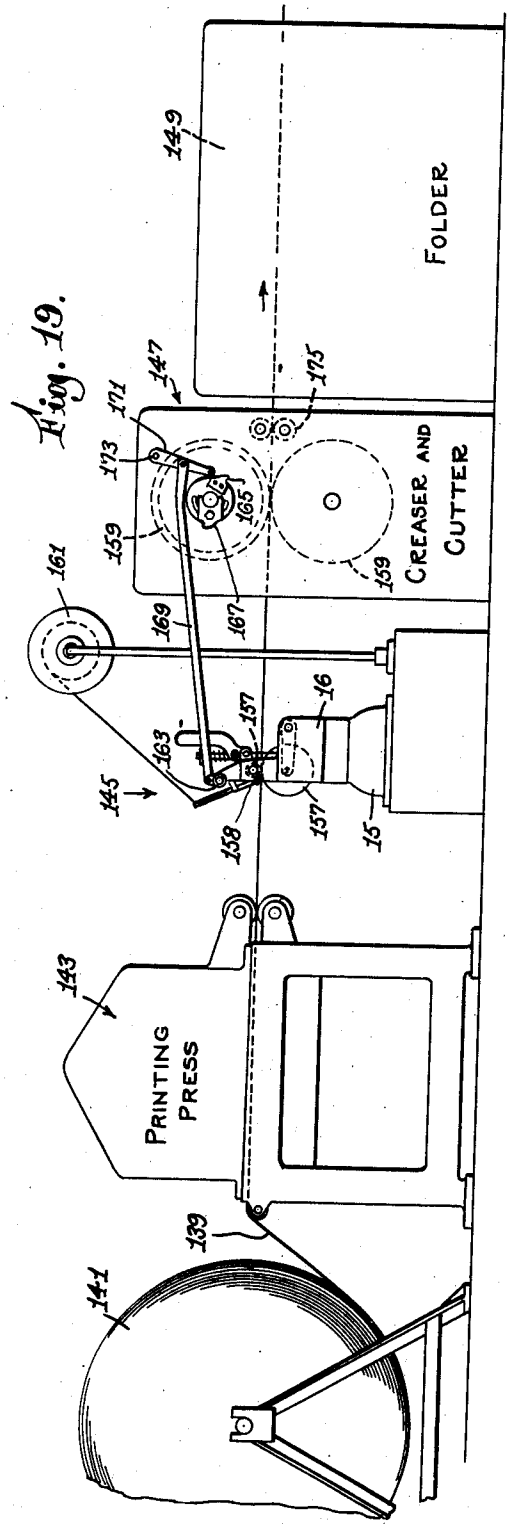


Fig. 19.

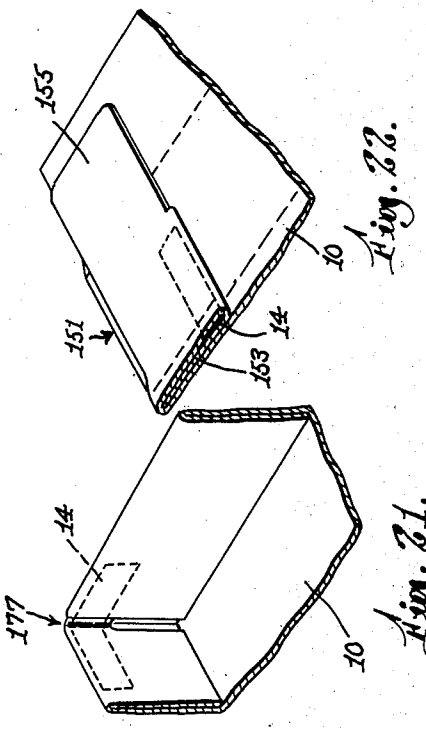


Fig. 22.

Fig. 21.

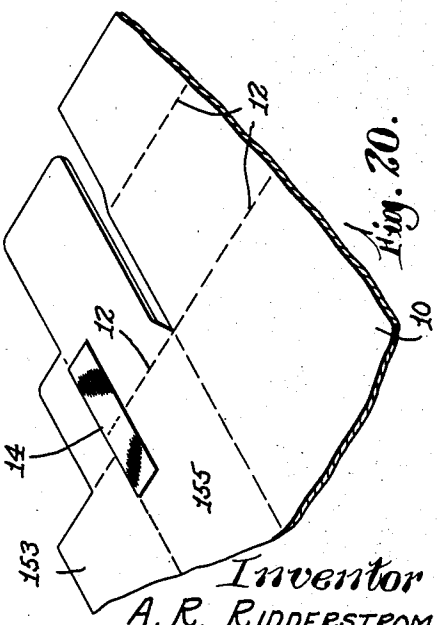


Fig. 20.

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UNITED STATES PATENT OFFICE

2,175,618

TAPE-APPLYING MACHINE

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Application June 16, 1938, Serial No. 213,990

11 Claims. (Cl. 93—56)

This invention relates to tape applying machines and more particularly to a machine for applying reinforcing tape to foldable box blank stock or blanks to reinforce the corners or fold lines of boxes formed therefrom, it being well known that such boxes are usually weak and likely to break along these lines. The primary object of the invention is to produce a machine which will automatically apply adhesive reinforcing tape to predetermined portions of blank stock or blanks where reinforcement is desired, the invention being adapted to the application of the adhesive tape to blanks or to strip stock during the formation of blanks therefrom.

My improved machine embodies means for feeding sheet stock or blanks along a predetermined path and, preferably during such feeding movement, applying the end of one or more adhesive tapes on predetermined portions thereof which are to be reinforced, whereupon a length of such tape is applied adhesively to the blank. The machine furthermore includes pressure rolls for feeding and pressing the tape on the blanks and severing means for cutting off the tape after a predetermined length thereof has been applied, including mechanism operated synchronously with the blank feeding mechanism whereby the tape is applied to the desired predetermined portions of the blanks.

In accordance with further aspects of the invention, the machine may be constructed to apply two or more adhesive tape portions to a blank simultaneously and in predetermined spaced relation laterally of the blank and the machine is furthermore adapted to apply the tape portions successively in predetermined spaced relation longitudinally along the blank, a novel feature of the invention residing in means for varying these spacings as desired. The construction and arrangement of the parts is such that means operated synchronously with the feeding of the blanks places the end of the adhesive tape in predetermined contact with the moving blank in advance of a pressure feeding roll which thereupon feeds and presses the tape into contact with the blank, the tape being drawn taut and severed when a predetermined portion thereof has been applied. The production of a machine embodying these and other features of the invention, all as hereinafter more specifically described, comprises a further object of the invention.

Further novel features of the invention relate to means for supporting and feeding from a stack of blanks and more particularly to a novel attachment for permitting the placing of additional blanks on the stack while maintaining the bottom blanks in proper feeding position.

These and other features of the invention will be best understood and appreciated from the following description of preferred embodiments thereof selected for purposes of illustration and shown in the accompanying drawings in which:

Fig. 1 is a plan view, partially in section and partially broken away, of a machine embodying my invention,

Fig. 2 is a fragmentary sectional view of Fig. 1 taken at a lower elevation,

Fig. 3 is a sectional elevation of the machine taken on line 3—3 of Fig. 1,

Fig. 4 is a fragmentary sectional view taken on line 4—4 of Fig. 3,

Fig. 5 is a detail view of a portion of Fig. 3 in another position,

Fig. 6 is a front view of the machine with the blank magazine eliminated,

Fig. 7 is a rear view thereof,

Fig. 8 is an elevation of one end of the machine, the driving wheel being omitted,

Fig. 9 is a fragmentary elevation of the other end of the machine,

Fig. 10 is a sectional view taken on line 10—10 of Fig. 7,

Fig. 11 is an enlarged fragmentary front view of a tape feeding mechanism,

Fig. 12 is an enlarged fragmentary sectional view taken on line 12—12 of Fig. 11,

Fig. 13 is a like view with the parts in another position,

Fig. 14 is a fragmentary perspective view of the tape carrying means,

Fig. 15 is a fragmentary perspective view of the tape severing knife mechanism,

Figs. 16, 17, and 18 are fragmentary views illustrating the feeding and severing of the tape,

Fig. 19 is a somewhat diagrammatic elevation of a machine embodying my invention and adapted to apply adhesive tape to strip stock,

Fig. 20 is a fragmentary perspective view of a blank taped in accordance with my invention,

Fig. 21 is a fragmentary corner view of a box formed from the blank,

Fig. 22 is a fragmentary view of the completed blank.

In Figs. 1–18, I have illustrated a machine embodying my invention in a form adapted to apply reinforcing adhesive tape to sheet blanks 10 which have been died out and creased on fold lines 12. The particular purpose of the tape portions 14 (Figs. 1 and 20) is to reinforce the resulting box at its corners when the blank has been

folded into the box form illustrated in Fig. 21. I shall now proceed to describe this machine.

This machine as illustrated is particularly adapted to apply four adhesive tape portions 14 to the blank 10 respectively adjacent to the four corners of the blank and across the fold lines 12 indicated in Fig. 1. The machine comprises a relatively long base 15 on which is mounted a fixed head 16 and a relatively adjustable head 18, a screw 19 being provided for adjusting the latter head, and bolts 20 being provided for securing this head and other parts in proper position on the base. The two heads carry pressure feeding rolls for the blanks and each head carries mechanism for handling an adhesive tape and applying the same to the blank adjacent to a side edge thereof. The head 18 is largely a duplication of the head 16 and the corresponding parts thereof are herein indicated by like reference characters primed.

Power is supplied to the machine through a belt driven wheel 22 on a shaft 24 carried in the head 16 and connected by a telescopic joint 25 to a like shaft 24' in the head 18. Blank feeding pressure rolls 26 and 26' are mounted on these shafts adjacent to their inner ends. Cooperating with the rolls are two relatively larger rolls 28 and 28' freely rotatable on the inner ends of studs 29 and 29' mounted in the free ends of arms 30 and 30' carried by shafts 32 and 32' in the heads 16 and 18. The rolls 28 and 28' are normally held upward to cooperate with rolls 26 and 26' by means of springs 33 and 33' on rods 34 and 34' connected to the free ends of arms 35 and 35' fixed to shafts 32 and 32'. The springs rest on brackets 36 and 36' pivotally carried by levers 37 and 37' pivoted to the heads 16 and 18 at 38 and 38', and the upper ends of the springs bear against caps 40 and 40' threaded to the rods. The rolls 28 and 28' may be retracted by moving the levers to the position indicated in broken lines in Fig. 8, and upward movement of the rolls is limited by adjustable stops 42 and 42'.

By manipulating the stops 42 and 42' and the caps 40 and 40' the distance between the feed rolls may be varied so that blanks of different thicknesses may be accommodated in the machine. Provision is made for retracting the lower rolls 28 and 28' so that access can be had to the tape feeding mechanism in order to thread new tape when a supply becomes exhausted.

Cooperating with the rolls 28 and 28' in advance of the rolls 26 and 26' are relatively small tape engaging and feeding rolls formed integrally with the inner ends of shafts 44 and 44' mounted in the heads 16 and 18. These small rolls are driven at the same surface speed as rolls 26 and 26' from shafts 24 and 24' through gearing 45, 46, 47, 48 and 45', 46', 47', and 48'.

Co-axial shafts 50 and 50' in bearings 51 and 51' of the heads 16 and 18 are connected together by a coupling 52 fixed to shaft 50 and telescopically splined to shaft 50'. The two tape feeding and severing mechanisms are associated with these shafts and are duplicates of each other. A description of the mechanism associated with shaft 50 will therefore suffice.

A support 54 for a roll of adhesive tape is provided for each head 16 and 18 and the tape from this roll leads downwardly at 55 to a tape receiving plate 56 carried on the free end of an arm 58 having its other end pivotally connected at 59 to a bracket 60 secured to the shaft 50. Intermediate of its ends this arm is pivoted to a bracket 62 carried by a stud 63 rotatably mounted in the machine. The tape is led through a notch 64 in the upper end of the plate 56, beneath an eccentric roll 65 which prevents retrograde movement of the tape, through a channel 66 provided on a resilient finger 67 and beneath a retaining finger 68, the tape being frictionally gripped between the fingers 67 and 68. This mechanism serves to carry the end portion of the tape to the blank as hereinafter described.

A serrated tape severing knife 70 is carried on one end of a shaft 71 supported for rotation in a bearing 72 on the free end of a lever 73 pivoted to the machine at 74. A link 76 anchored to the shaft 50 has its free end pivoted at 77 to an arm 78 on the other end of the shaft 71 whereby holding the pivot 77 in fixed position. A link 80 connects the free end of the lever 73 with a bracket 82 secured to the shaft 50, the bracket 82 projecting away from the shaft on the side opposite to the bracket 60. This mechanism serves automatically to sever the tape after it is applied to the blank, all as hereinafter described.

A magazine 84 for supporting a supply of sheet blanks 10 is provided in advance of the rolls 26, 26' and 28, 28', the magazine having a front plate 85 with an opening 86 at the bottom of a size to permit only one blank to pass therethrough and this opening being in horizontal alignment with the bite between the blank engaging rolls. The rear portion of the bottom wall of the magazine is preferably convexed upwardly at 87 (Fig. 4) and cooperating therewith is an endless chain 88 having equally spaced blank engaging lugs 89 positioned successively therealong to engage the bottom blanks and force them forwardly to the feed rolls. The chain is driven by a sprocket 90 and extends over an idler 91, a chain tightening idler being provided at 92.

The bottom blank is held firmly down at 87 for engagement by the lugs 89 by a bar 94 resting on the top of the stack. The bar carries a link 95 having its upper end connected to an arm 96 pivoted to a post 97 fixed to the machine on posts 98. Downward pressure is exerted on the arm and bar by springs 99 mounted on rods 100 connected to a bar 101 fixed to the post 97, the springs being backed up by caps 102 threaded to the rods.

Since it is desirable that downward pressure shall be constantly maintained on the blank stack I have provided an attachment for permitting the addition of more blanks to the top of the stack without releasing this pressure. This attachment comprises a blank supporting shelf 103 supported on the machine by links 105 and having an operating handle 107. The front end of the shelf converges to an edge which can be inserted between the top of the stack and an upwardly-rearwardly flaring plate 109 carried by the bar 94. A spring 111 connected to the front end portion of the shelf and to the machine therebeneath serves to place pressure on the stack when the shelf is thus located. Additional blanks may thus be supplied to the top of the stack while pressure thereon is maintained, all as illustrated in Fig. 5.

As the bottom blank is fed from the stack, the tape handling mechanism applies the tape portions 14 to the predetermined portions of the blank illustrated in Fig. 1. Such action is assured by driving the tape applying and blank feeding mechanisms synchronously from the belt driven wheel 22 as will now be described.

The sprocket 90 is mounted on the inner end

of a shaft 113 supported for rotation in brackets 115 secured to the base 15, and this shaft is driven from the shaft 24 through intermeshing gears 117 and 119. Also mounted on the shaft 113 is a disc 121 carrying a fixed cam 123 and a cam 125 relatively adjustable along a slot 127. As the disc is rotated in the direction of the arrow (Fig. 10) these cams engage a roller 129 on a link 131 and raise the link, the link normally dropping by gravity. The lower end of this link is movably supported on the head 16 by a pivotal connection 133. The upper end of the link is pivotally connected to a bracket 135 secured to the shaft 50. Thus the cams give the shaft 50 rocking movements in the direction of the arrow (Fig. 12), the shaft returning quickly under the action of gravity as the roller drops off the cams. It will be apparent that the interval between the two shaft movements imparted by the cams can be varied by adjusting the cam 125 along the slot 127.

The operation of the machine in applying adhesive tape portions 14 to blanks 10 as shown in Figs. 1–18 and above described will now be briefly outlined. The head 18 is first adjusted to position, spacing the pressure feed rolls 26, 26', and 28, 28' and the cooperating tape handling mechanisms a distance apart corresponding to the lateral spacing desired of the tape portions on the blank. Also the cam 125 is adjusted to a position so spaced from the cam 123 that the tape portions on each blank will be spaced apart longitudinally of the blank the required distance as illustrated in Fig. 1.

Upon rotation of the power wheel 22 and its shaft 24 from initial starting position, the chain 88 is driven to engage one of its lugs 89 with the rear edge of the bottom blank in the stack and force this blank forwardly to a position wherein it is engaged between the rolls 44—28 and rolls 26—28 as illustrated in Fig. 16. During this movement of the blank the tape handling mechanism is in its normal position (Fig. 16). Upon continued feeding movement of the blank, the cam 123 rocks the shaft 50 in the direction indicated in Fig. 12. Such rocking movement (1) so rocks the arm 58 about the bracket 62 and stud 63 as to move the free tape-carrying end of the arm to the position indicated in Fig. 17 and (2) lifts the lever 73 about its pivot 74 whereby not only raising the tape severing knife 70 but also (due to the anchored pivot 77) rotating the knife about the axis 71, to the position illustrated in Fig. 17.

Such movements simultaneously place the end of the tape in contact with the moving blank and withdraw the knife. The overhanging end of the tape thereupon passes beneath the roll 44 whereupon the combined tape and blank are gripped and fed along between rolls 44—28 and to rolls 26—28. This action continues until the roller 129 rides off the cam 123 and during which period a predetermined length of tape is drawn into adhesive contact with the blank. When the roller rides off the cam, the quick reverse rocking movement of the shaft 50 under the action of gravity snaps the parts to the position indicated in Fig. 18. In this position the plate 56 has retreated whereby pulling the tape taut and the knife has dropped to a position severing the taut tape. The blank continues its feeding movement and when the cam 125 engages the roller 129 the shaft 50 is given another like rocking movement whereupon the succeeding tape portion 14 illustrated in Fig. 1 is applied in like manner. It will be understood that, while I have herein described the operation of one head only, the other head operates simultaneously and in like manner therewith.

In Fig. 19 I have illustrated mechanism adapting the application of reinforcing adhesive tape to blank stock in strip form during the printing, creasing, cutting and folding of such stock into box blanks. In this case the stock in strip form 139 is drawn from a supply roll 141. As illustrated, the strip passes successively through suitable printing mechanism 143, tape applying mechanism 145, blank creasing and cutting mechanism 147, and finally the blanks are folded at 149 to the form illustrated at 151 in Fig. 22. In this form the side walls 153 of the blank are folded onto the side walls 155 and these combined walls 153—155 are then folded into contact with the body of the blank. However, the invention herein concerns only the tape applying mechanism 145 in conjunction with the strip feeding and blank forming mechanism.

The tape applying mechanism 145 is substantially the same as that heretofore described except that the pressure rolls 157 corresponding to rolls 26—28 are not driven. The relatively small roll 158 cooperating with the lower roll 157, and corresponding to the small roll 44 shown in Figs. 16–18, is driven at a surface speed corresponding to the surface speed of the feed rolls 159 which feed rolls also perform the creasing and cutting of the strip into blanks, the adhesive tape being drawn from a supply roll 161. The rock shaft 163, corresponding to rock shaft 50, is operated by cams 165 and 167 on one of the feed roll shafts, these cams corresponding to the cams 123 and 125 shown in Fig. 10, and a rod 169 and lever 171 pivoted at 173 provide a driving connection therebetween.

It will now be apparent that as the strip 139 moves forwardly under the action of the rolls 159 the tape is applied thereto in positions determined by the cams 165 and 167 and the arrangement of these cams is such that the tape is applied to the strip not only within the outlines of the blanks to be subsequently formed therefrom but also in the specific locations desired, as the locations illustrated in Fig. 1. The operation of the tape applying mechanism is otherwise the same as has already been described in connection with Figs. 1–18. Rolls 175 may also be provided for passing the severed blanks into the folder 149.

The tape is applied to the corners of the blanks across the fold lines 12 as illustrated in Fig. 20 which tape reinforces the corners of the resulting box as illustrated at 177 in Fig. 21. As the blanks leave the mechanism illustrated in Fig. 19 they are folded to the form illustrated at 151 in Fig. 22.

Having thus disclosed my invention and described one embodiment thereof, what I claim as new and desire to secure by Letters Patent of the United States is,—

1. A tape applying machine comprising in combination, means for feeding a sheet along a predetermined path, means for supporting a supply of adhesive tape, means including a finger carrying the free end portion of the tape, means operated synchronously with the sheet feeding means for moving the finger to carry the end of the tape onto a predetermined portion of the sheet while the sheet is in feeding motion, means including a roll for engaging the tape and pressing it into firm contact with the sheet during continued feeding movement of the sheet, means operated in conjunction with the finger for thereafter holding the tape taut between the sheet and finger, and

means for severing the tape adjacent to the end of the finger while thus held.

2. A tape applying machine comprising in combination, a pair of rolls for engaging a sheet therebetween and feeding the sheet along a predetermined path, a relatively small roll cooperating with one of the first-named rolls in advance of the other roll, means for supporting a supply of tape, means carrying the free end portion of the tape adjacent to and in advance of said small roll, means operated synchronously with the sheet feeding rolls for moving the tape carrying means to engage the end of the tape with a predetermined portion of the sheet in advance of the small roll while the sheet is in feeding motion whereupon the combined tape and sheet pass under pressure contact between the small roll and the roll cooperating therewith, and means for thereafter severing the tape a predetermined distance from its end.

3. A tape applying machine comprising in combination, means for supporting a sheet for movement along a predetermined path, means for supporting a supply of adhesive tape, means for carrying the end of the tape, a tape severing knife adjacent thereto, a shaft, means connecting the tape carrying means and knife to the shaft, and means for rocking the shaft in one direction and causing the knife to withdraw and the tape carrying means to feed the end of the tape onto a predetermined portion of the sheet, rocking movement of the shaft in the opposite direction being adapted to withdraw the tape carrying means and move the knife forwardly to sever the tape.

4. A tape applying machine comprising in combination, two pairs of feeding rolls for engaging spaced portions of a sheet and feeding the sheet along a predetermined path, a shaft parallel with the rotary axes of the rolls, means carried by the shaft for supporting the free ends of two adhesive tapes respectively adjacent to and in advance of said two pairs of rolls, means operated synchronously with the rolls for rocking the shaft in one direction to feed the ends of said tapes onto predetermined portions of a sheet being fed by the rolls, and means operatively connected to the shaft for severing the tapes upon movement of the shaft in the opposite direction.

5. A tape applying machine comprising a plurality of laterally adjustable heads each of which includes a set of the following elements: a pair of blank feeding rolls, a third roll disposed in advance of said feed rolls, a rock shaft, a tape delivering finger linked to said rock shaft, a knife also linked to said rock shaft, and cam actuated means responsive to the rotation of said feed rolls for rocking said shaft first to deliver tape from said finger to a blank under said third roll and subsequently to sever the tape.

6. A combined blanking and taping machine, comprising a sheet strip feeder, a creaser and cutter, a folder, and means in advance of said creaser and cutter and controlled thereby for applying lengths of adhesive tape to selected portions of said sheet strip, said means including a rock shaft, a tape delivering finger moved in one stroke of said rock shaft, and a serrated knife operating on the reverse stroke of said rock shaft for severing the tape.

7. A tape applying machine comprising a pair of cooperating feed rolls, means for varying the distance between said feed rolls, a rock shaft disposed adjacent said rolls and arranged to be actuated at predetermined intervals, a tape delivering finger controlled by said rock shaft, a tape severing knife, said finger and knife being actuated in alternate strokes of said rock shaft, and means for retracting the lower feed roll to provide access to said tape delivering finger.

8. In a combined blanking and taping machine including a sheet strip feeder, a creaser and cutter, and a folder; means for applying lengths of adhesive tape to selected portions of said sheet strip, said means including a cam associated with the creaser and cutter, a link operated by said cam, a rock shaft actuated by said link, a tape delivering finger, and a tape severing knife, said finger and knife being arranged to be actuated by alternate movements of said rock shaft.

9. A tape applying machine comprising a pair of cooperating feed rolls, means for varying the distance between said feed rolls, a rock shaft disposed adjacent said rolls and arranged to be actuated at predetermined intervals, a tape delivering finger controlled by said rock shaft, and a tape severing knife, said finger and knife being actuated in alternate strokes of said rock shaft.

10. A tape applying machine comprising a pair of feed rolls, a presser roll disposed in advance of the bite of said feed rolls and bearing on the lower feed roll, and a tape delivering finger arranged to deliver the free end of an adhesive tape on the surface of a blank being fed through the rolls, whereby the end of the tape is engaged first between the presser roll and the blank and then between the upper feed roll and the blank, all of said rolls co-operating to feed and unite the tape and the blank.

11. The tape applying machine defined in claim 10 wherein means is provided for varying the distance between the feed rolls.

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