

March 3, 1964

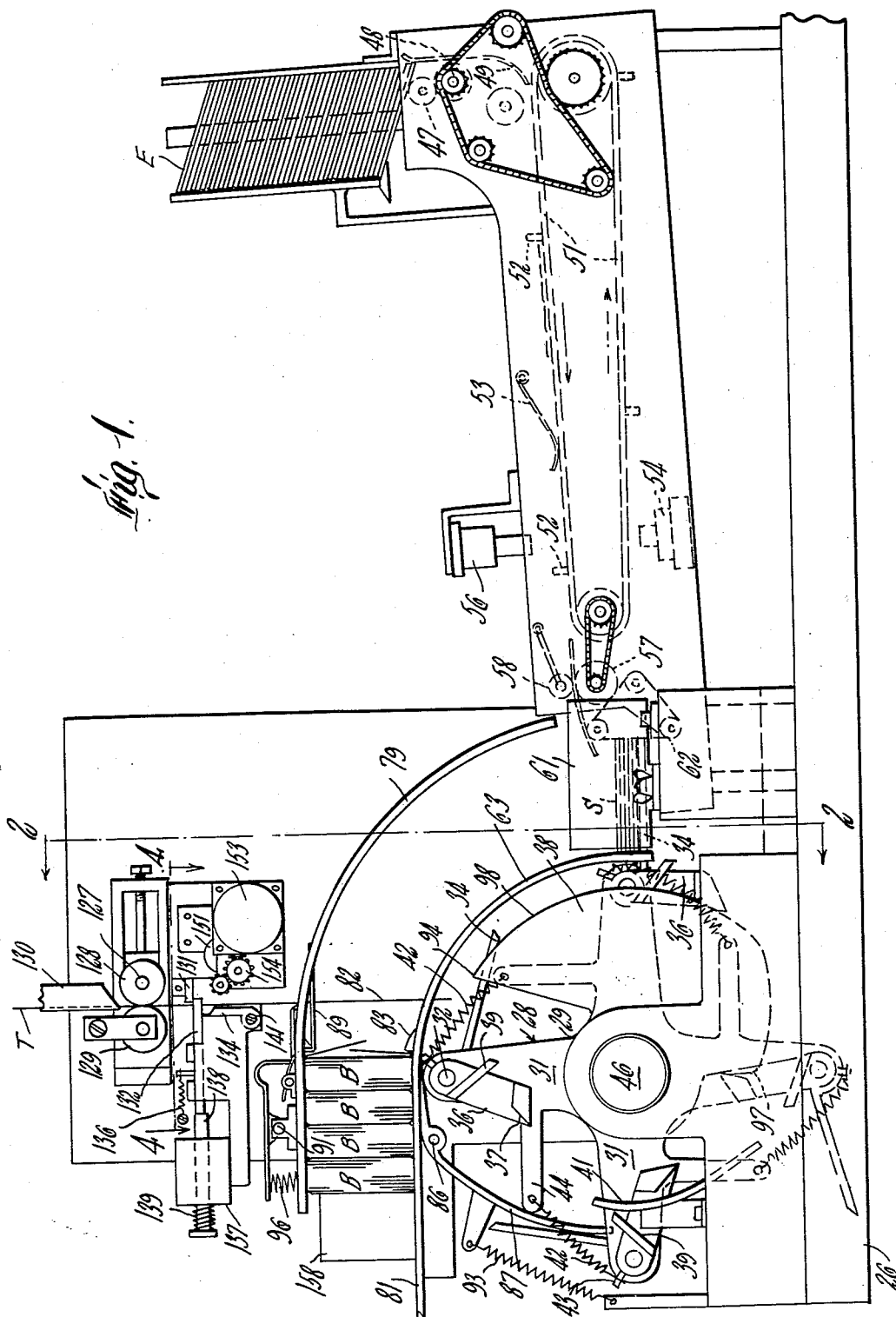
K. STEMMLER

3,122,870

ENVELOPE BANDING MACHINE

Filed Sept. 20, 1961

6 Sheets-Sheet 1



March 3, 1964

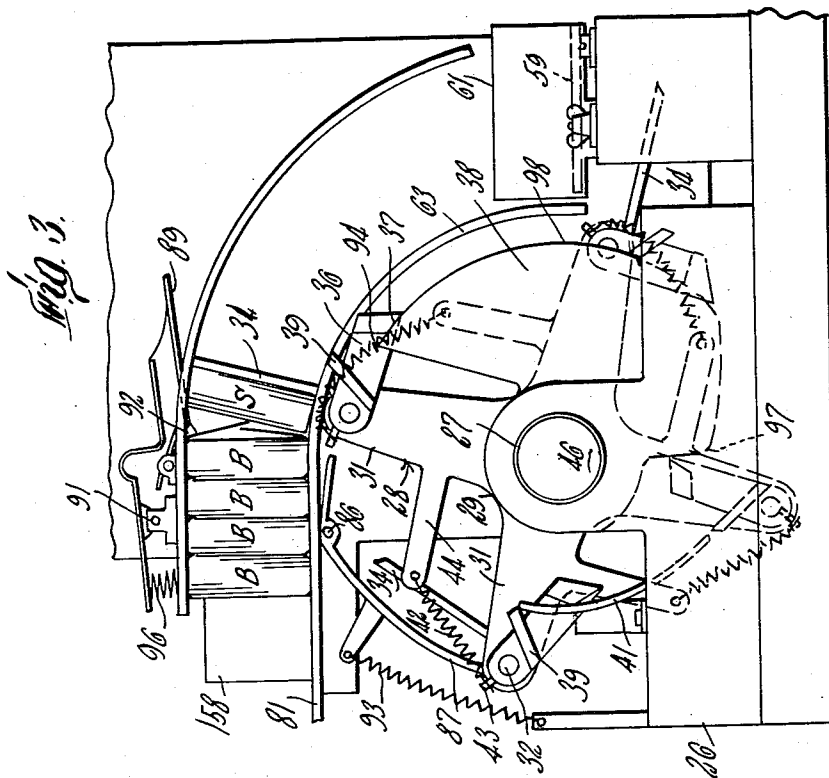
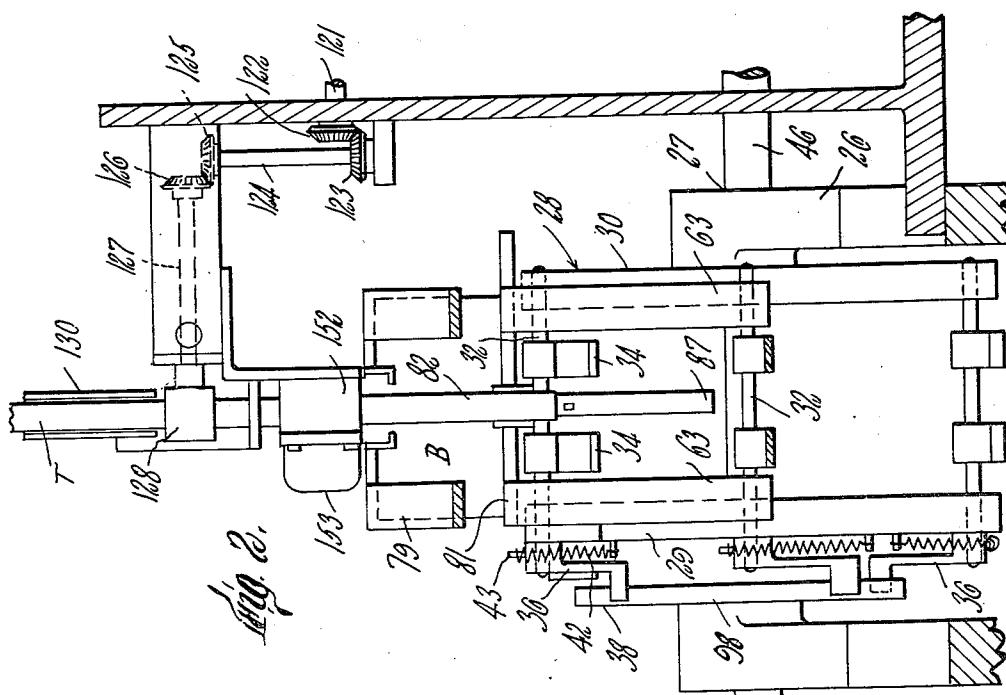
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ENVELOPE BANDING MACHINE

Filed Sept. 20, 1961

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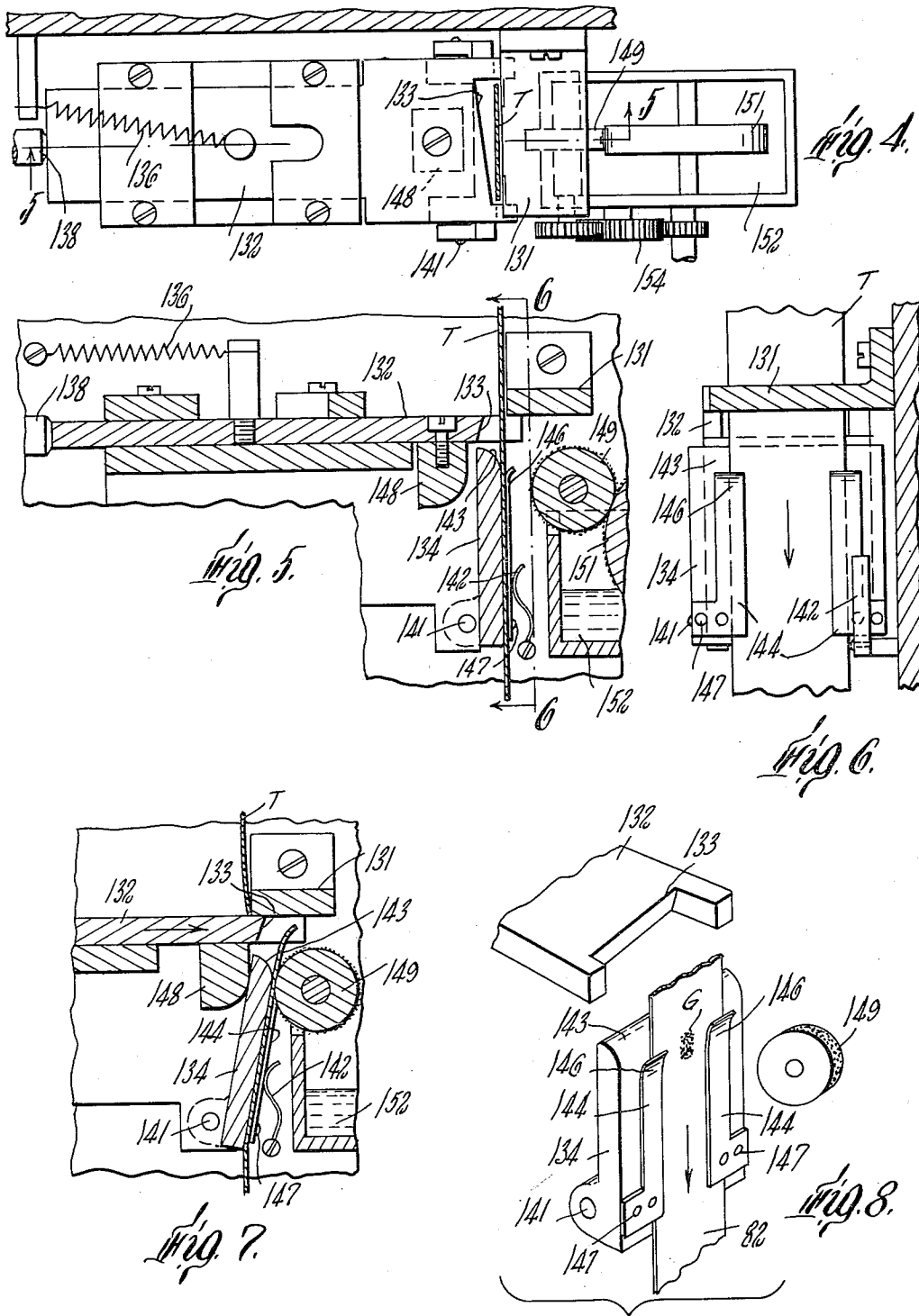
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ENVELOPE BANDING MACHINE

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ENVELOPE BANDING MACHINE

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Fig. 9. Fig. 10. Fig. 11.

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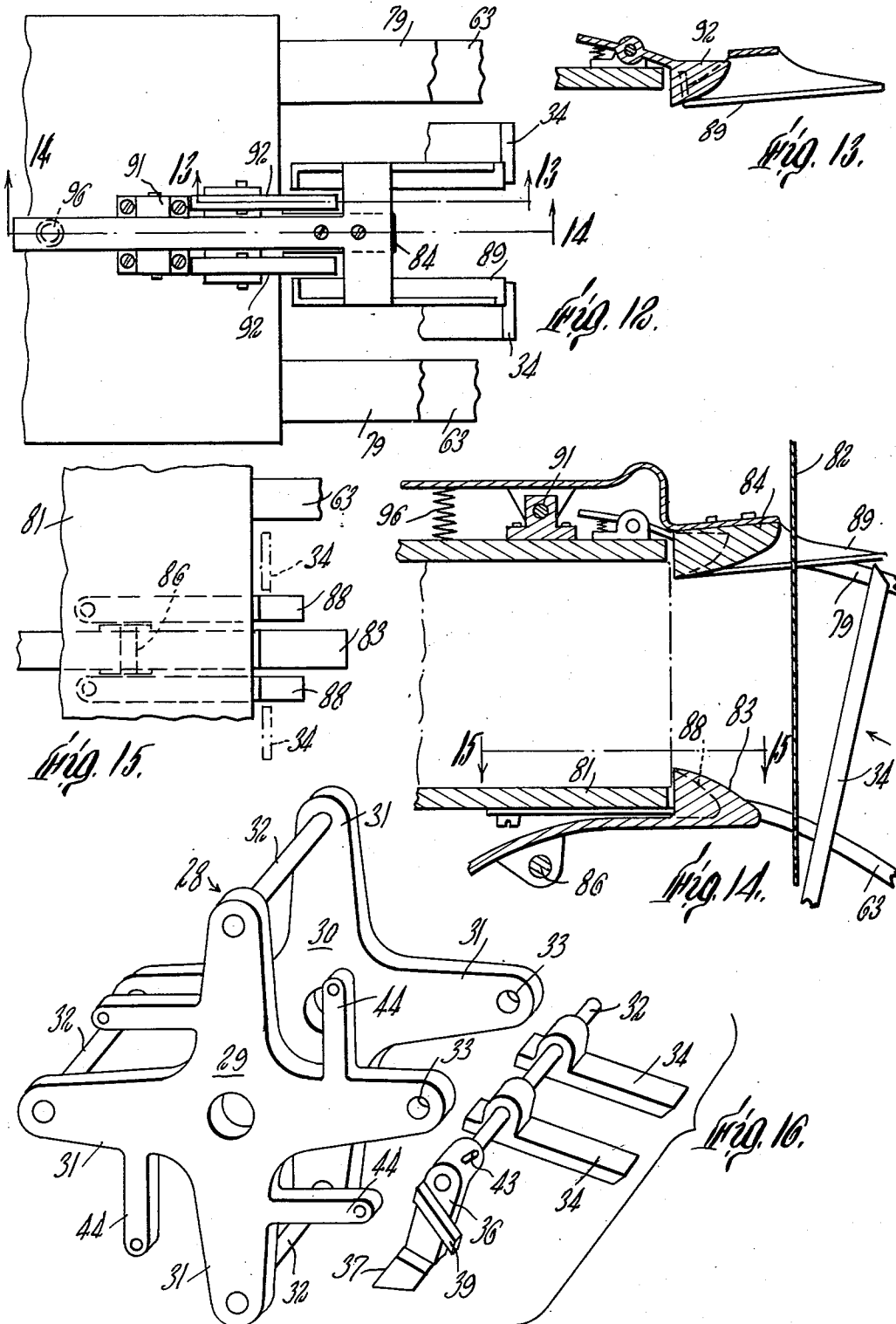
K. STEMLER

3,122,870

ENVELOPE BANDING MACHINE

Filed Sept. 20, 1961

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March 3, 1964

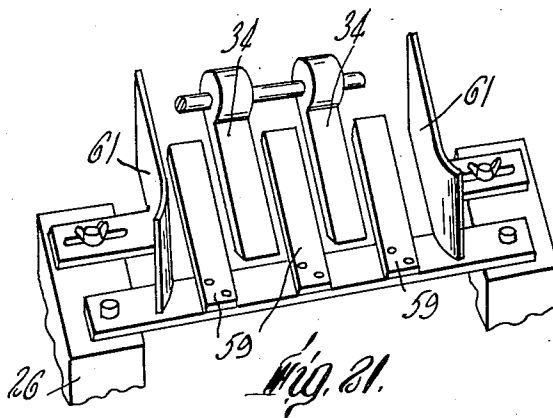
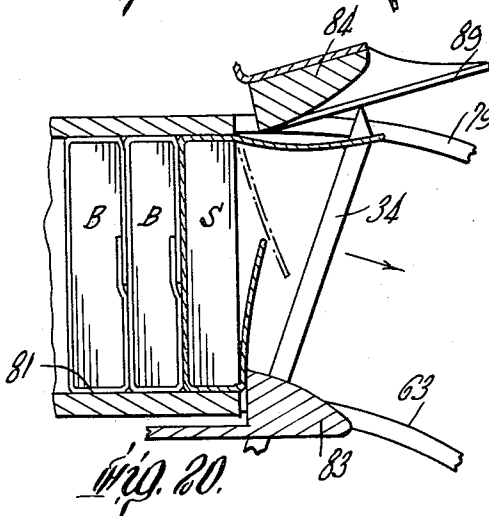
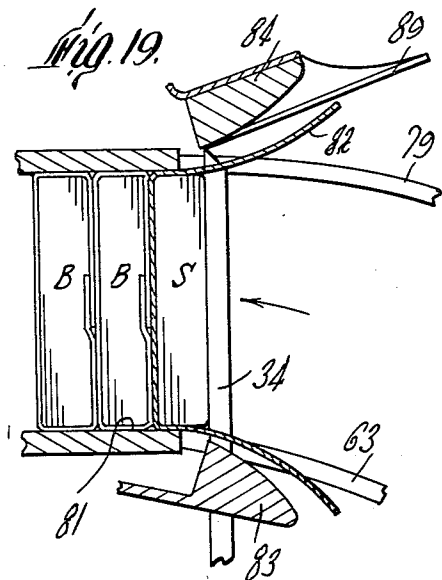
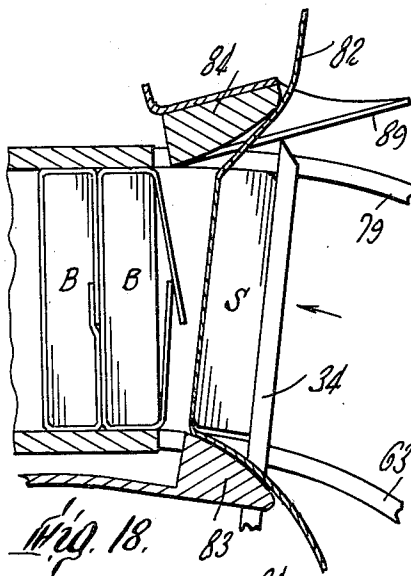
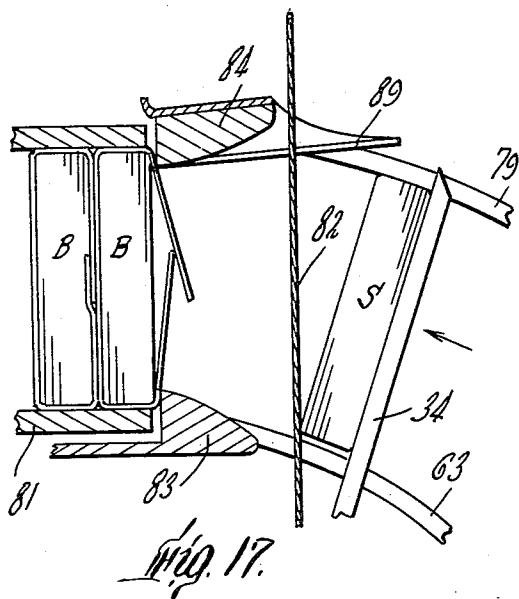
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ENVELOPE BANDING MACHINE

Filed Sept. 20, 1961

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3,122,870

ENVELOPE BANDING MACHINE

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Filed Sept. 20, 1961, Ser. No. 139,435
13 Claims. (Cl. 53-198)

This invention is an improved banding machine for envelopes and like articles. Such machines automatically apply and secure a wrapping band of paper tape or similar material around a stack of envelopes or similar articles, to produce a bundle containing a predetermined number of such articles which can be handled thereafter as a unit. Many prior machines for this purpose are relatively slow in operation, undependable in action and require the constant attention of an operator in order to perform reliably.

The term "envelope" is intended herein to include all articles of like flat character such as cards, folders, mailing pieces, etc. which are adapted to be banded in the manner here discussed.

One of the objects of the present invention is to provide an envelope banding machine which is capable of operating reliably at much higher speeds than heretofore, that is, counting and banding on the order of 1,000 envelopes per minute. Thus, a banding machine of this invention may be used directly following a modern high speed envelope producing machine, a printing press, or other processing machine for the articles to be banded.

Another object is to provide a machine which may be adjusted readily to vary the count or number of envelopes in stacks being banded, for example over a range as high as 36 envelopes per bundle and as low as 5 envelopes per bundle.

A further object is to make provision for accommodating a wide variety of sizes and types of envelopes in a banding machine without making major alterations to the necessary mechanisms.

Still another object of this invention is to utilize the forces of gravity and the motion and position of the stacks or bundles of envelopes within the machine to perform some of the band wrapping and band sealing operations. In this way costly and complicated mechanisms for these purposes heretofore required are eliminated.

A still further object is to provide a compact machine which will occupy a comparatively small floor space and which may be moved from one location to another to serve different envelope manufacturing machines, presses, or other processing equipment as occasion demands.

These and incidental objects are met according to one example of the invention by providing an open envelope collecting station where previously counted envelopes are collected in vertical stacks of horizontally arranged envelopes. When a full desired count is reached, a rotatable transporting frame is indexed 90° to move the stack upward and away from the collecting station in an arcuate path, thus clearing the collecting station for another stack without interrupting the counting and collecting. Most of the band wrapping operation is accomplished near the end of the arcuate motion by engagement of the moving stack against a freely suspended precut and preglued wrapping band arranged in the path of movement of the stack. Elements which complete the wrapping of the band around the stack serve to hold the bundle after it is wrapped and before pressure is applied to seal the glue on the band. Pressure is applied to seal each bundle by pressing the following bundle against a previously wrapped bundle. According to the preferred form of this invention improved mechanisms also are provided

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for feeding, cutting, holding and applying a spot of glue to the wrapping band.

The above objects, other objects and advantages and further details of that which is believed to be novel and included in this invention will be clear from the following description and claims, taken with the accompanying drawings in which is illustrated an example of envelope banding machine embodying the present invention and incorporating the rotatable transporting frame and other improvements noted above.

In the drawings:

FIG. 1 is a side elevational view of an envelope banding machine in a position of rest, together with an envelope feeding and counting arrangement which may be used to supply the banding machine;

FIG. 2 is a vertical sectional view of the banding machine of FIG. 1 on the line 2-2 thereof;

FIG. 3 is a side elevational view of the banding machine similar to FIG. 1 but showing parts in a position they assume while a stack of envelopes is being wrapped with a band;

FIG. 4 is an enlarged horizontal sectional view on the line 4-4 of FIG. 1 showing in plan view parts of the preferred band cutting, glue applying and band holding mechanisms in the machine;

FIG. 5 is a vertical sectional view of these mechanisms on the line 5-5 of FIG. 4 in a position of rest;

FIG. 6 is a vertical sectional view at right angles to FIG. 5 and on the line 6-6 thereof showing mainly the arrangement for holding the wrapping band;

FIG. 7 is a vertical section like part of FIG. 5 but showing parts in the positions they occupy when the band is being cut and glue applied;

FIG. 8 is a fragmentary perspective view of the principal active parts illustrated in FIGS. 4 through 7, for cutting, holding and gluing the band;

FIG. 9 is an end elevational view of the envelope banding machine from a direction opposite that of FIG. 2 illustrating driving mechanisms and arrangements for the machine;

FIG. 10 is a vertical sectional view of the drive on the line 10-10 of FIG. 9;

FIG. 11 is a side elevation of a typical cam-controlled switch used in the drive, for example as indicated opposite line 11-11 of FIG. 9;

FIG. 12 is an enlarged plan view of the upper envelope band applying mechanisms, these parts being shown in elevation near the top of FIG. 1;

FIG. 13 is a vertical section on line 13-13 of FIG. 12 showing the upper band applying mechanism;

FIG. 14 is a vertical section on the line 14-14 of FIG. 12 on a further enlarged scale, showing parts of both the upper and lower band applying mechanisms;

FIG. 15 is a horizontal section or plan view on the line 15-15 of FIG. 14 showing the lower parts of the envelope banding mechanism;

FIG. 16 is an exploded perspective view showing some of the principal elements for transporting stacks of envelopes in the banding machine;

FIG. 17 is a vertical section like FIG. 14 but with band applying elements in the positions they occupy just before a stack of envelopes is to be wrapped in a band;

FIG. 18 is a view like FIG. 17 but with the parts just as the wrapping of a band is being started;

FIG. 19 is like FIG. 17 with the parts in the stage closely following that of FIG. 18;

FIG. 20 is also like FIG. 17 but showing the parts at a point where the wrap of the band has been completed at the bottom and is about to be completed at the top of a stack envelopes, and

FIG. 21 is a perspective view showing parts at the starting end or envelope collecting station of the machine.

In carrying out the objects of the invention, in one preferred embodiment thereof a base or supporting frame 26 carries all of the other parts of the machine unless otherwise indicated.

The key elements of this machine, the ones which determine the nature and action of all the rest, are those involved in moving the stacks of envelopes from the station or location where they are collected to the station or location where banded bundles of envelopes leave the machine. Although illustrated in other figures of the drawings, FIG. 16 shows these elements apart from the rest so that their nature and relationship may be readily understood. Horizontally journaled as at 27 in the base is a rotatable envelope transporting frame 28 with similar cross shaped end pieces 29 and 30. Each end piece has four identical radially extending arms 31 at right angles to each other. Joining the ends of opposite arms on the end pieces are cross rods 32 which are suitably rotatably mounted as in bearings 33. Secured to each rotatable cross rod 32 so as to move therewith are a pair of spaced parallel stack lifting blades or fingers 34. One end of each cross rod is extended through its bearing 33 outside of the end piece 29 and a cam follower arm 36 is fixed to this end of the cross rod. In operation, a main cam follower surface 37 on the end of arm 36 engages against a stationary cam 38 and thereby controls the position of the stack lifting blades during certain positions of rotation of the transporting frame 28 as will be later made apparent. A secondary cam follower surface 39 on the arm 36 serves to initiate reverse movement of the blades 34 by engagement with a cam reversing guide 41 at another position of rotation. Each cam follower arm with its attached cross rod and stack lifting blades is biased in a clockwise direction toward a retracted position by means of a tension spring 42 extending between an anchor pin 43 on the cam follower arm and a supporting post 44 which may be provided on each of the arms 31 of the end piece 29.

Obviously other cross rods like the cross rods 32, but not rotatable, may extend between the end pieces 29 and 30 to hold them in properly fixed and spaced relationship with respect to each other so that the transporting frame 28 including both end pieces will be rotatable as a unit in the journal 27, being driven in a counter-clockwise direction by the main driving shaft 46.

For purposes of illustration there is shown in FIG. 1 an arrangement for counting and feeding envelopes to the banding machine. The exact nature of this arrangement is not of importance here because the banding machine may be used in connection with envelope handling or processing apparatus of any sort which will feed envelopes one by one horizontally and will generate a starting impulse or signal whenever the desired count for a stack of envelopes has been reached. In the exemplary counting and feeding arrangement envelopes are suitably dealt one by one as by a picker 47 from the bottom of a pile or stack of envelopes E and driven between a roll 48 and a guide chute 49 to the top of a horizontally moving conveyor belt or chain 51 having locating pins 52 thereon which pick up each envelope and move it toward the banding machine. A positioning spring brush 53 arranged above the conveyor may be used to align the envelopes properly against the pins 52 just before each envelope passes between a light source 54 and a photoelectric cell 56 near the end of the conveyor. As each envelope passes the light beam coming from the source 54 it interrupts that beam and causes a signal to be produced in the photo cell 56 in a manner well known in the art. In a like well known manner the signals from the photo cell are counted as in a commercially available electronic impulse counter of the necessary type which is adjustable to give an output signal or impulse after receiving a preselected proper number of input signals. This

output signal is used to operate the envelope banding machine and it constitutes the only necessary interconnection between the drive for the envelope feeding and counting arrangement and the drive for the banding machine, these instrumentalities being otherwise entirely independent although timed to operate generally at compatible rates of speed. Individual envelopes may be discharged from the conveyor as by a high speed discharge roll 57 having a cooperating idler 58 so that each envelope is ejected rapidly toward the loading or collecting station of the banding machine.

As the envelopes are counted and reach the banding machine one by one from the feeding and counting arrangement above described or in some other fashion, they are collected in a vertical stack of horizontally arranged envelopes as at S, being received upon stationary spaced table strips 59 suitably supported by the base 26 outside of the path of movement of the rotatable frame 28. Spaces between the table strips 59 allow for free movement of the extended stack lifting fingers 34 therethrough so that a stack of envelopes collected on the table strips may be lifted therefrom when the transporting frame is rotated and the fingers or blades pass by the table strips. Adjustable side guiding plates 61 help to hold envelopes in proper position at the collecting station formed above the table strips, and a constantly downwardly driven aligning belt 62 (indicated diagrammatically in FIG. 1) may further align the envelopes and keep the top envelope in the stack from accidentally interfering with the next incoming envelope as the stack is being built up. The opposite edges of the stacked envelopes S abut against the lower ends of a pair of arcuate stationary guiding strips 63 which have curved surfaces coinciding with the arc of swing of the stack lifting blades 34 for purposes which will be later apparent. As may be seen most easily in FIGS. 2 and 12, the guiding strips 63, although following the arc of movement of the blades 34, are located on either side of the path of movement of the blades and do not interfere therewith.

Table strips 59, side plates 61, aligning belt 62 and the lower ends of arcuate guide strips 63 define a roughly rectangular area, open at its top, which serves as an envelope collecting station or location into which envelopes are fed horizontally and held in proper stacked position for later lifting by the stack lifting fingers 34. Before the machine is started, side plates 61 are set in a position to accommodate the length or width of envelopes being banded, and the belt 62 or equivalent aligning means is also adjustably mounted in any suitable manner for positioning toward or away from the guide strips 63 to match the height of the envelopes being processed. These are the only adjustments necessary in adapting the machine to band a relatively wide range of envelope sizes and shapes.

Before or while a stack of envelopes is being built up at the collecting station, the envelope transporting frame is rotated so that a pair of the stack lifting blades is positioned in the spaces between the table strips and at the same level, being held in that position, extending radially from the arms 31, by engagement of cam follower 37 with the main cam 38. The transporting frame and other moving parts of the banding machine are timed and driven through a constantly motor driven power shaft 64 intermittently driving a pulley 66 which is engaged or disengaged from the power shaft by action of a magnetic clutch 67. When the clutch is in engaged position the pulley is driven to move a larger pulley wheel 68 through a belt 69, and this ultimately rotates the main driving shaft 46 through one quarter turn to rotate or index the envelope transporting frame through an arc of 90°, which is one banding cycle of the machine. The driving and precise positioning of the transporting frame in each 90° cycle or increment of movement may be obtained as through a pulley shaft 71 driven by the pulley wheel 68 which in turn drives a Geneva gear driving disc 72 fixed

on the shaft. The driving disc has a driving pin 73 engageable with the driving slots of a Geneva gear 74 of conventional construction. The Geneva gear is fixed to the driving shaft 46 so that each time that the pulley shaft 71 rotates once the driving shaft turns ninety degrees. A single revolution control is provided for the pulley shaft through a stop cam 76 mounted on the end of the shaft, this cam controlling the action of a switch 77 for a magnetic brake 78 so that each time the shaft is rotated the cam will operate the switch and the switch will apply the brake to prevent overrunning. Obviously, the clutch 67 and brake 78 are so connected electrically that the clutch and the brake will function properly, without interference.

As previously described, an output signal will be produced from an electronic counter every time a preset number of impulses has been received from the photoelectric cell 56. This indicates that the proper number of envelopes or other articles has been collected for a bundle and the output signal will be used to engage clutch 67 and release brake 78 to start a banding cycle. As the frame 28 is rotated through its increment of 90° the radially extended stack lifting blades at the collection station quickly raise the stack of envelopes S out of the way of further incoming envelopes and swing the stack of counted envelopes in an arc, moving the envelopes in the stack from horizontal toward vertical position. During this movement, centrifugal force will tend to move the individual envelopes outwardly from the axis of rotation of the transporting frame but they are held against flying outwardly by a pair of upper arcuate guiding bars or strips 79 spaced outwardly from and arranged generally parallel to the guides 63. The lower ends of the guides 79 start above the envelope collecting station so that envelopes are free to enter, and at those ends the guides 79 are spaced radially from the guides 63 somewhat more widely than they are spaced apart at their upper ends, as shown in the drawing. This leaves a tapered converging arcuate guiding path for the stack of envelopes and centrifugal force against the envelopes throws them outwardly and jogs to align or straighten them with respect to each other as they are being raised. This obviates any later hand or machine jogging of banded envelopes which is necessary in some prior machines.

The lower curved guides 63 lead to and are tangent in their curvature with a horizontal bundle receiving or delivery table 81 fixed to the frame of the machine. The guides 79 may be extended for a short distance horizontally above the receiving table but their function has ceased when once a band is wrapped around a stack of envelopes. When a counted stack is approaching the ends of the curved portions of the guides 63 and 79 it strikes against a freely suspended precut and preglued length of paper tape or similar material 82 lightly frictionally held (by means which will later be described) in the center of the path of movement of the stacked envelopes. As will be understood most readily with reference to FIGS. 12 through 15 and the series of FIGURES 17 through 20, the band is applied by movement of the stack against the band and between a pivoted lower band applying element 83 and a pivoted upper band applying element 84. The lower band applying element 83 is pivoted to the machine frame as at 86 at a point below the bundle receiving table and has an actuating arm 87 extending on the other side of the pivot in the path of movement of the cross rods 32 on the envelope transporting frame so that each time a pair of lifting blades 34 approaches the position where its stack of envelopes is about to be wrapped with a band, the end of the arm 87 will be struck and moved outwardly by the moving cross rod 32 extending between the radial arms 31 which precede the arms carrying the stack. This retracts the band applying element 83 below the guides 63 and out of the path of movement of the stack of envelopes. Previously banded envelopes are held in position as by light spring

hooks 88 at the end of the table 81 which are capable of being pushed out of the way by the weight of envelopes reaching the table but which catch under the edges of banded envelopes and prevent them from sliding off the table.

Soon after this in the progress of movement of the transporting frame the tips of the arms 34 will strike against lifter extensions 89 on the upper band applying element 84, raising this element away from the top of the moving stack (see FIG. 18) by pivoting element 84 about its pivot 91. The upper edges of previously wrapped bundles are prevented from shifting when element 84 is raised by providing upper light spring hooks which may be like the spring hooks 88 or in the form of the pivoted spring pressed hooks 92 shown in FIG. 13.

While the stack of envelopes is being moved between the lowered band applying element 83 and the raised band applying element 84 the strip of paper tape 82 is being carried by the envelope stack and guided generally around the bottom and top thereof by the elements 83 and 84 respectively. A point will soon be reached when the band 82 will be pulled free from the means frictionally holding it and the partially banded bundle will reach the bundle receiving table 81 as shown in FIG. 19. At that point the preceding cross rod 32 on the transporting frame will ride out from under the end of actuating arm 87 of element 83 and spring 93 will pull the arm and lift the band applying element 83 so that its forming tip folds the bottom end of the band 82 upwardly around the bundle as indicated in FIG. 20. At almost this same instant, but timed so as to occur just after restoration of the element 83, the cam follower 37 controlling the lifting blades 34 which have been moving the stack of envelopes, will ride off sharp edge 94 of the cam 38, allowing the spring 42 to rotate the cross rod 32 and move the blades 34 clockwise away from the bundle. As this happens, the ends of the blades will fall away from the lifter extensions 89 of the element 84 and spring 96 will rock the element about its pivot, lowering its forming tip to fold the upper end of band 82 downwardly against the bundle in overlapping arrangement with the previously folded lower end of the band. A spot of glue G has been previously applied to what is now the inner side of the upper end of the band but the ends of the band have not been pressed together to perfect their sealing. The sealing of the band on a previously wrapped bundle B was accomplished at the stage of FIG. 19 when a following stack of partially wrapped envelopes was pushed by the blades 34 against the previously banded stack.

The blades 34, after retraction at the top of the transporting frame, remain retracted so that on the next indexing of the frame they will clear the underside of the bundle receiving table 81. In subsequent indexing of the transporting frame the secondary cam follower 39 on the cam follower arm 36 will engage against the reset guide 41 as seen in FIG. 3 and start to swing the cross rod 32 counterclockwise to move the stack lifting blades 34 back toward their radially extending position. Further indexing of the rotatable transporting frame brings the main cam follower surface 37 against a curved blade resetting surface 97 on cam 38 leading to the segmental circular surface 98 of the cam. When the cam follower 37 is riding on the circular surface 98 the blades 34 are held in their fully radially extended stack lifting position as they approach the envelope collecting station or location at the table strips 59.

It is essential to the present invention that proper arrangements be provided for supplying the paper tape for the banding operation, for cutting it to proper length, for applying a glue spot thereto and for holding it ready for use in banding a stack of envelopes. Details of a preferred novel arrangement are illustrated in FIGS. 2, 9 and 10 of the drawings, as to the drive for supplying the tape, and in FIGS. 1 and FIGS. 4 through 8 as to devices for cutting, applying glue and holding the precut and

preglued tape. The drive starts with the pulley shaft 71, which as previously explained makes one revolution when required by the envelope counting instrumentalities. Mounted on the shaft 71 is a pulley gear 101 meshing with a transfer gear 102 on a separate shaft 103. Reduction gear 104, also on shaft 103, engages a drive gear 106 on a shaft 107 which also carries a Geneva driving disc 108 having a driving pin 110 cooperating with the slots of tape driving Geneva gear 109 mounted on shaft 111. One quarter turn of shaft 111, caused by one quarter turn of the Geneva gear, will actuate a gear train 112 resulting ultimately in driving of the tape for banding. In the arrangement shown, the gear train 112 starts with a gear 113 on shaft 111 and works through gears 114 and 115 on a shaft 116, gears 117 and 118 on shaft 119 and gear 120 on a bevel gear drive shaft 121. Shaft 121 carries a bevel gear 122 at its end matching with bevel gear 123 at the lower end of upright shaft 124 which carries another bevel 125 at its upper end. Another matching bevel gear 126 is rotated by bevel gear 125 to drive a final tape driving shaft 127 on which a tape driving roller 128 is fixed.

The above described arrangement is such that a single rotation of the pulley shaft 71 produces one rotation of the Geneva driving disc 108 and a quarter turn of Geneva gear 109. This quarter turn, through the gear train 112, results in a sufficient number of rotations or revolutions of the tape driving roller 128 to drive the tape for the required distance to supply a complete band for a stack of envelopes. The tape or banding material T comes from a large supply reel (not shown) to the tape driving roller 128 and a cooperating spring pressed tape drive idler 129, being guided to this location by a tape guiding chute 130, only the end of which is illustrated in the drawings. For proper driving, the roller 128 is faced or coated with rubber or some similar friction producing material.

The end of the tape guiding chute 130 and the tape driving roller 128 with its cooperating idler 129 are located immediately above the tape cutter and holder, comprising principally a fixed cutting edge 131 extending across the width of the tape, a reciprocating knife 132 with a biased cutting edge 133 cooperating with the fixed edge 131 and a swinging tape holding element 134 arranged below the knife. The knife is normally held away from its cutting position as by a retracting spring 136 extending between an anchor on the machine frame and a post on the knife blade and is moved toward the cutting position shown in FIG. 7 by energization of the winding of a solenoid 137 having a reciprocating knife driving core 138 and its own retracting spring 139.

The tape holder 134 is pivoted as at 141 near its bottom edge and is normally held in an upright tape receiving position as by a leaf spring 142 bearing thereagainst and forcing the free end of the tape holder against a suitable stop wall or shoulder. The outer face of the tape holder is designed to serve as a guide for the tape as it is being driven and for this purpose is provided with an upper curved edge 143 and a pair of side tape guiding and holding arms 144 made of thin spring metal curved outwardly at their upper ends as at 146 and anchored near their lower ends as at 147 on the tape holder on either side of the intended path of movement of the tape. Spring arms 144 are carefully positioned and adjusted not only to guide the tape properly across the face of the tape holder 134 but also to exert sufficient friction against the tape to hold a cut length suspended from the holder in proper position for banding a stack of envelopes moved thereagainst as previously explained.

The tape is cut and a spot of glue or other adhesive applied almost simultaneously whenever the core of the solenoid 137 moves the knife 132. A projection 148 fixed to the underside of the knife moves therewith against the back face of the tape holder 134, swinging the holder

about its pivot until the opposite face of the holder carries the tape which it holds thereon against a glue applying roller 149. This will provide a spot of glue G to the cut tape 82. Roller 149 is supplied with glue from a glue feeding roller 151 rotated in a reservoir of glue 152 as by a constantly driven glue feeding motor 153 driving appropriate gears 154 which in turn suitably move the glue applying and feeding rollers in a manner readily understood.

For proper operation it is necessary that the banding tape be driven, cut and glue applied in advance of the time when a stack is to be moved thereagainst, but after a previous length of strip has been used to band a stack of envelopes. Therefore, when the single cycle revolution of pulley shaft 71 is started, driving pin 73 on the disc 72 is positioned to enter immediately into a slot on the Geneva gear 74 and turn the transporting frame 90° during the first 90° of rotation of the shaft 71. On the other hand, the Geneva driving pin 110 on the disc 108 is so positioned that it does not begin to move the tape driving Geneva gear 109 until near the last quarter of rotation of the disc 108. Because of the relative sizes chosen for the gears 101, 102, 104 and 106, the shaft 107 and the disc 108 are moving at a slower rate of speed than the shaft 71 and the transporting frame 28 has completed its quarter turn in the first quarter of rotation of the shaft 71. Therefore at some time after the transporting frame has been moved and stopped, the tape driving Geneva 109 will be actuated to drive the tape rapidly, actually shooting it out from between the driving roller 128 and the idler 129. Timing of actuation of the tape cutoff solenoid 137 is obtained from one of the elements in the drive which makes but a single revolution during a banding cycle. Shown here is a switch operating arm 156 on the disc 72 adapted to strike against and move the actuator of a solenoid energizing switch 157 during the last few degrees of movement of the disc 72. In practice it may be preferable to mount this switch operating arm on the disc 108 with the switch 157 actuated during the last few degrees of movement of the element 108 for more precise timing relative to the motion of the tape drive. The switch 157 is connected to the solenoid 137 in an obvious manner so that the solenoid is actuated and the knife 132 moved against the cutting edge 131 to sever the tape and apply a spot of glue just after driving of the tape has been stopped. The spring holding arms 144 then frictionally hold the and glued tape from the tape holder 134 in position ready for the next banding operation.

Reviewing the operation of the machine, it will be seen that envelopes will be counted and collected on the table strips 59 at the collecting station until a full count has been reached. A signal from the counter then starts the drive of the transporting frame and snaps it through its cycle of one quarter turn. Envelopes for the next batch will continue to be delivered to the collecting station as they are counted. The envelopes in the moving stack will be turned 90° in their arcuate path, from horizontal to vertical position, being jogged while they travel, and will strike against a freely hanging precut and preglued length of paper tape. As movement of the stack continues, the tape will be wrapped around the stack of envelopes forming a bundle, the tape being pulled free from its frictional anchor in the process, and the lower band applying element will fold the lower end of the tape upwardly around the bottom of the bundle, the upper band applying element then folding the upper end of the tape over the top edge of the bundle in overlapping relationship with the lower tape end, the bundle being held on the delivery table at that stage after retraction of the lifting blades on the transporting frame. The bundle thus produced will have pressed against the overlapping ends of the tape on the previous bundle, allowing the glue previously applied to stick the ends of the tape in the previous bundle together. An appro-

appropriate bundle follower 153 in the form of a slidable weight may be placed on the table 81 to serve as a movable backing or support for the bundles of envelopes being produced. This is customary in many machines of the general character here under discussion, but it serves the additional purpose in the present machine of assisting in the sealing of the ends of the tape together as bundle after bundle reaches the receiving table.

Immediately after one wrapped bundle has been positioned on the delivery table 181 the drive is started to supply another length of precut and pregled tape. The is done actually after movement of the envelope transporting frame has been stopped and before any subsequent cycle of this transporting frame can be started.

The machine may be altered to serve as a "tabber," that is, to insert unglued strips in the form of projecting tabs between batches of a certain predetermined number of envelopes. This is done by changing the tape drive to one which will feed only about half the length of paper tape as that required for banding, providing no effective glue-applying arrangement, and disabling the upper band-applying element 84.

Because the banding machine itself does not contain the counting mechanism but merely goes through its cycle whenever a starting impulse is received from the counter after an accumulated count, there is no problem in changing the number of envelopes in each stack, even in the middle of a run. All that is required is to change the output setting of the counter which is actuated by impulses from the photocell so that it produces an output signal after the desired changed number of envelopes has been detected.

Although the stack lifting blades or fingers 34 are shown here in pairs, any other desired number may be used in each set. Also, although usually called "blades," they may have a sectional shape other than the flat form shown, as long as the stack lifting surfaces of each set are located, when extended, in a single plane approximately radially of the axis of rotation of the transporting frame.

The end pieces 29 and 30 of the frame need not be cross shaped, but could be any other desired shape as long as provision is made for mounting the sets of lifting blades at proper spacing around the axis of the frame. Four sets of blades are shown because this number lends itself to easy indexing through an increment of 90° as by the Geneva gear arrangement shown and has proven to be the best arrangement for the performance desired.

Fewer or greater numbers of lifting blade sets might be used on the transporting frame with appropriate changes in the blade driving and indexing arrangements. However, changes in the indexing angle to something substantially above or below 90° should be made with care because of accompanying problems in proper positioning and holding of envelopes at the collecting or receiving stations.

As will be evident from the foregoing description, certain aspects of this invention are not limited to the particular details set forth as an example, and it is contemplated that various and other modifications and applications of the invention will occur to those skilled in the art. It is therefore intended that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of the invention.

What is claimed as new and is desired to be secured by Letters Patent of the United States is:

1. A machine for wrapping stacks of counted articles of the character described in bands of tape, comprising a stationary open top article collecting station adapted to accommodate horizontally arranged articles in a vertically extending stack therein, means for counting and feeding articles horizontally to said station, a horizontal receiving table adapted to accommodate vertically arranged articles in horizontally extending wrapped bundles thereon, means for lifting and turning a said stack

through an arcuate path upwardly from said collecting station to said receiving table including a stack transporting frame rotatably mounted on a horizontal axis alongside said collecting station, four sets of stack lifting blades spaced equally around said frame and mounted to move with relation to the frame between one position where said blades extend radially outwardly beyond the frame toward said collecting station and another position where said blades are retracted within said frame, means rotatably indexing said frame in increments of 90° in one direction about its axis whenever a preselected number of counted articles accumulates at said station, one set of blades being carried by said frame during each indexed increment of said frame from a first location horizontally alongside the axis of the frame and under said collecting station to a second location vertically above said axis and alongside said receiving table, means moving said blades to said one radially extending position at said first location and maintaining said blades extended while indexing therefrom to said second location, whereby a stack is adapted to be lifted from said collecting station by a set of blades, turned in said arcuate path and deposited at said receiving table as said transporting frame is indexed, and means moving said blades to the other, retracted position after reaching said second location, tapering arcuate guides inside and outside the path of movement of said extended blades adapted to confine and jog a stack being moved and turned by said blades, means driving a predetermined length of banding tape, means cutting said length, means applying a spot of glue thereto near the upper end of the cut length and means frictionally holding and freely suspending said cut and glued length of tape at its upper end vertically in advance of said second location in the path of movement of a stack being lifted and turned by said blades, engagement of the moving stack against the tape pulling the tape free of the holding means, band applying means folding said tape first around the bottom and next around the top of a stack as it reaches said receiving table at said second location, the glued end thereby overlapping the other end of the tape and the movement of a following stack to said receiving table pressing the overlapping ends of the tape on a preceding stack together to secure the ends of the tape and complete a banded bundle.

2. A machine for wrapping stacks of counted articles of the character described in bands of tape comprising an article collecting station adapted to collect horizontally arranged articles in a vertically extending stack therein from a counting and feeding source, a receiving table adapted to receive vertically arranged articles in horizontally extending bundles thereon, means for moving and turning a stack from said collecting station through an arcuate path to said receiving table including a stack transporting frame rotatably mounted on a horizontal axis alongside said collecting station, a set of stack lifting blades on said frame mounted to move with relation to the frame between one position where said blades extend radially outwardly beyond the frame toward said collecting station and another position where said blades are retracted within said frame, means rotatably indexing said frame in one direction about its axis when a counted stack is collected at said station, said set of blades being carried by said frame during indexing of said frame from a first location alongside the frame and under said collecting station to a second location above said frame and alongside said receiving table, means moving said blades to said one radially extending position at said first location and maintaining said blades extended while indexing therefrom to said second location, whereby a stack is adapted to be moved from said collecting station by said blades and deposited at said receiving table as said transporting frame is indexed, and means moving said blades to the other, retracted position after reaching said second location, guides alongside

the path of movement of said blades adapted to confine a stack being moved and turned by said blades, means holding a length of banding tape in advance of said second location in the path of movement of a stack being carried by said blades, and band applying means folding said tape around a stack reaching said receiving table to complete a banded bundle.

3. A machine for wrapping stacks of counted articles of the character described in bands of tape comprising a stationary rectangular collecting station adapted to collect articles in a stack therein from a counting and feeding source, a receiving table adapted to receive articles in bundles thereon, means for moving a stack from said station to said table including a stack transporting frame mounted to move alongside said collecting station and said receiving table, sets of stack moving blades carried by said frame and mounted to move with relation to the frame between one position where said blades extend outwardly beyond the frame toward said collecting station and receiving table and another position where said blades are retracted within said frame, means indexing said frame in one direction when a counted stack is collected at said station, one set of blades being carried by said frame during each indexing of said frame from a first location adjacent said collecting station to a second location adjacent said receiving table, means moving said blades to said one outwardly extending position at said first location and maintaining said blades extended while indexing therefrom to said second location, whereby a stack is adapted to be moved from said collecting station to said receiving table by a set of blades as said transporting frame is indexed, and means moving said blades to the other, retracted position after reaching said second location, guides alongside the path of movement of said extended blades adapted to confine a stack being moved by said blades, means holding a length of banding tape in advance of said second location in the path of movement of a stack being carried by said blades, and band applying means folding said tape around a stack reaching said receiving table to complete a banded bundle.

4. In a machine for separating stacks of counted flat articles by strips of tape inserted therebetween, an article collecting station at one level adapted to accommodate vertically extending stacks of horizontally arranged articles, means for counting and feeding articles horizontally to said collecting station, a horizontal receiving table at a higher level adapted to accommodate horizontally extending stacks of vertically arranged articles, means for lifting and turning a counted stack upwardly from said collecting station level through an arcuate path to said horizontal receiving table level including sets of stack lifting blades driven in an arcuate path between said collecting station and said receiving table, arcuate guides adapted to confine stacks moved and turned by said blades, means frictionally holding and freely suspending a length of tape in the path of movement of a stack carried by said blades in advance of said horizontal receiving table, the movement of a stack against the tape pulling said tape free of its frictionally holding means and carrying it in front of the stack whereby said stack is separated from a previous stack on said receiving table by the length of tape thus inserted.

5. In a machine for separating stacks of counted flat articles by strips of tape inserted therebetween, an article collecting station adapted to accommodate stacks of articles individually counted and fed thereto, a receiving table adapted to accommodate stacks of counted articles, means for moving and turning a stack of counted articles from said collecting station through an arcuate path to said receiving table including sets of stack moving blades driven in an arcuate path between said collecting station and said receiving table, arcuate guides adapted to confine a stack being moved and turned by said blades, means frictionally holding a length of tape in the path of movement of a stack carried by said blades in advance

of said receiving table, the movement of a stack against the tape pulling the tape free of its frictionally holding means and carrying it in front of the stack whereby said stack is separated from a previous stack on said receiving table by the length of tape thus inserted.

6. In a machine for separating stacks of flat articles by strips of tape inserted therebetween, a collecting station adapted to collect stacks of said articles fed thereto, said articles being inclined substantially away from the vertical at said collecting station; a receiving station adapted to receive stacks from said collecting station, said articles being substantially vertical at said receiving station; means for moving a stack from said collecting station to said receiving station including a set of stack moving blades driven arcuately between said collecting station and said receiving station; guides adapted to confine and align stacks moved by said blades; means holding a length of tape in the path of movement of a stack carried by said blades in advance of said receiving station, the movement of a stack against the tape being accompanied by releasing of the tape from its holding means and the stack carrying the tape in front of it whereby said stack is separated from a previous stack at said receiving station by the length of tape thus inserted.

7. In a machine for wrapping stacks of counted articles of the character described in bands, a means for moving said stacks to a band wrapping means comprising a stack transporting frame rotatably mounted on a horizontal axis, four sets of stack lifting blades spaced equally around said frame and pivotally mounted to move with relation to the frame between one position where said blades extend radially outwardly beyond the frame and another position where said blades are retracted within said frame, means resiliently biasing said blades toward said retracted position, means rotatably indexing said frame in increments of 90° in one direction about its axis, one set of blades being carried by said frame from a first location horizontally alongside the axis of the frame to a second location vertically above said frame axis during each indexed increment of said frame, a stationary cam pivoting said blades to said one radially extending position at said first location and maintaining said blades extended while indexing therefrom to said second location, said cam permitting pivoting of said blades by said biasing means to the other, retracted position after reaching said second location, and band wrapping means located adjacent said second location in the path of movement of a stack carried by said blades.

8. In a machine for wrapping stacks of articles of the character described in bands, a means for moving said stacks to a band wrapping means comprising a rotatably mounted stack transporting frame, sets of stack moving blades spaced equally around said frame and mounted to move with relation to the frame between one position where said blades extend outwardly beyond the frame and another position where said blades are retracted within said frame, means rotatably indexing said frame in increments in one direction, one set of blades being carried by said frame from a first location alongside the frame to a second location angularly displaced from said first location during each indexed increment of said frame, means moving said blades to said one outwardly extending position at said first location and maintaining said blades extended while indexing therefrom to said second location, and means moving said blades to the other, retracted position after reaching said second location, and band wrapping means located in the path of movement of a stack carried by said blades.

9. In a machine for wrapping stacks of articles of the character described in bands, a means for moving said stacks to a band wrapping means comprising a movably mounted transporting frame, a set of stack moving blades on said frame and mounted to move with relation to the frame between one position where said blades extend outwardly beyond the frame and another position where said

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blades are retracted, means indexing said frame in one direction between a first and a second location, said set of blades being carried by said frame from said first location to said second location during each indexing of said frame, means moving said blades to said one extending position at said first location and maintaining said blades extended while indexing therefrom to said second location, and means moving said blades to the other, retracted position, after reaching said second location, and band wrapping means adjacent said second location.

10. In banding machine wherein a stack of envelope like articles is to be banded by a predetermined cut length of tape having a glue spot applied thereto, a fixed horizontal tape cutting edge, a cooperating horizontally reciprocating knife, means driving a predetermined length of tape vertically between said edge and said knife, a pivoted tape guiding and holding element below said edge and knife in the path of movement of tape driven between said edge and knife, spring means on said holding element for guiding and frictionally holding tape thereon, a glue applying source located adjacent said pivoted element for applying a glue spot to tape held thereon when said element is pivoted to a glue applying position, means moving said knife against said cutting edge to cut the tape when a predetermined length has been driven therebetween, a projection on said knife engageable with said pivoted element whereby tape cutting movement of said knife moves said pivoted element to said glue applying position and the holding means on said pivoted element thereafter holds the cut and glued predetermined length of tape vertically for use in banding a stack of said articles.

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11. A machine of the character set forth in claim 9, wherein said band wrapping means comprises a lower band applying element actuated first by engagement of said indexing transporting frame thereagainst, and an upper band applying element later actuated by engagement of said stack moving blades in extending position thereagainst.

12. A machine of the character set forth in claim 9, wherein said band wrapping means comprises a lower band applying element and an upper band applying element each actuated separately and sequentially by engagement of said indexing transporting frame thereagainst.

13. A machine according to claim 6, wherein said means for moving a stack is a rotary means, said stack moving blades being driven in a circular arc between said collecting station and said receiving station, and said guides comprise opposed stationary arcuate members converging toward each other to confine and align stacks moved by said blades, whereby said flat articles are jogged to align their edges as a stack of said articles is moved from said collecting station to said receiving station.

References Cited in the file of this patent

UNITED STATES PATENTS

2,917,884	Winkler	Dec. 22, 1959
2,951,697	Bernhart	Sept. 6, 1960
2,998,972	Pearce	Sept. 5, 1961

FOREIGN PATENTS

858,142	Great Britain	Jan. 4, 1961
625,166	Canada	Aug. 8, 1961

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,122,870

March 3, 1964

Kurt Stemmler

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 47, for "mechanisms" read -- mechanism --; line 71, before "envelopes" insert -- of --; column 6, line 34, for "came" read -- cam --; column 8, line 48, before "and" insert -- cut --; column 9, line 11, for "The" read -- This --.

Signed and sealed this 5th day of January 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents