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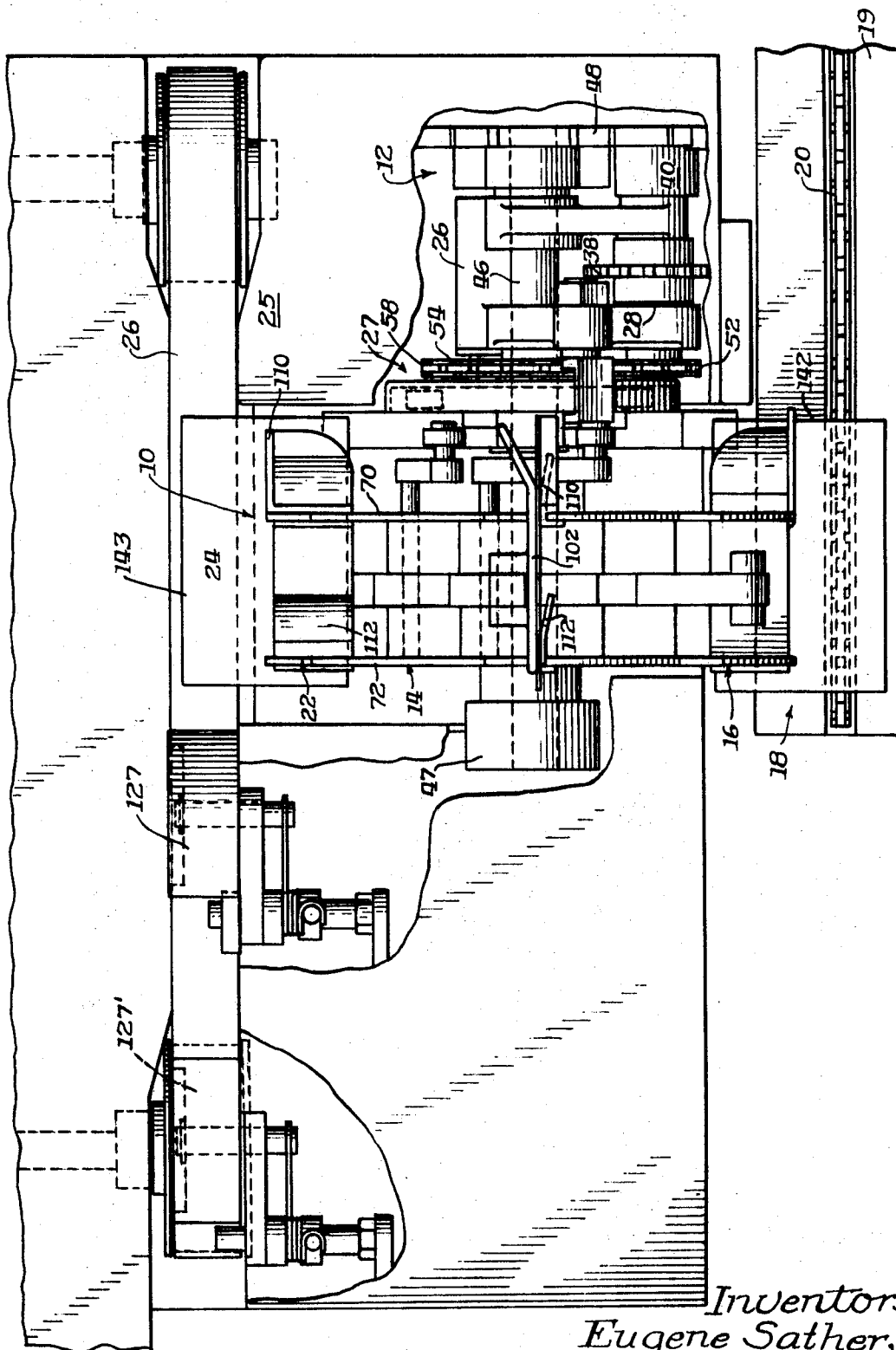
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ENVELOPE TURNOVER APPARATUS

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4 Sheets-Sheet 1

Fig. 1.



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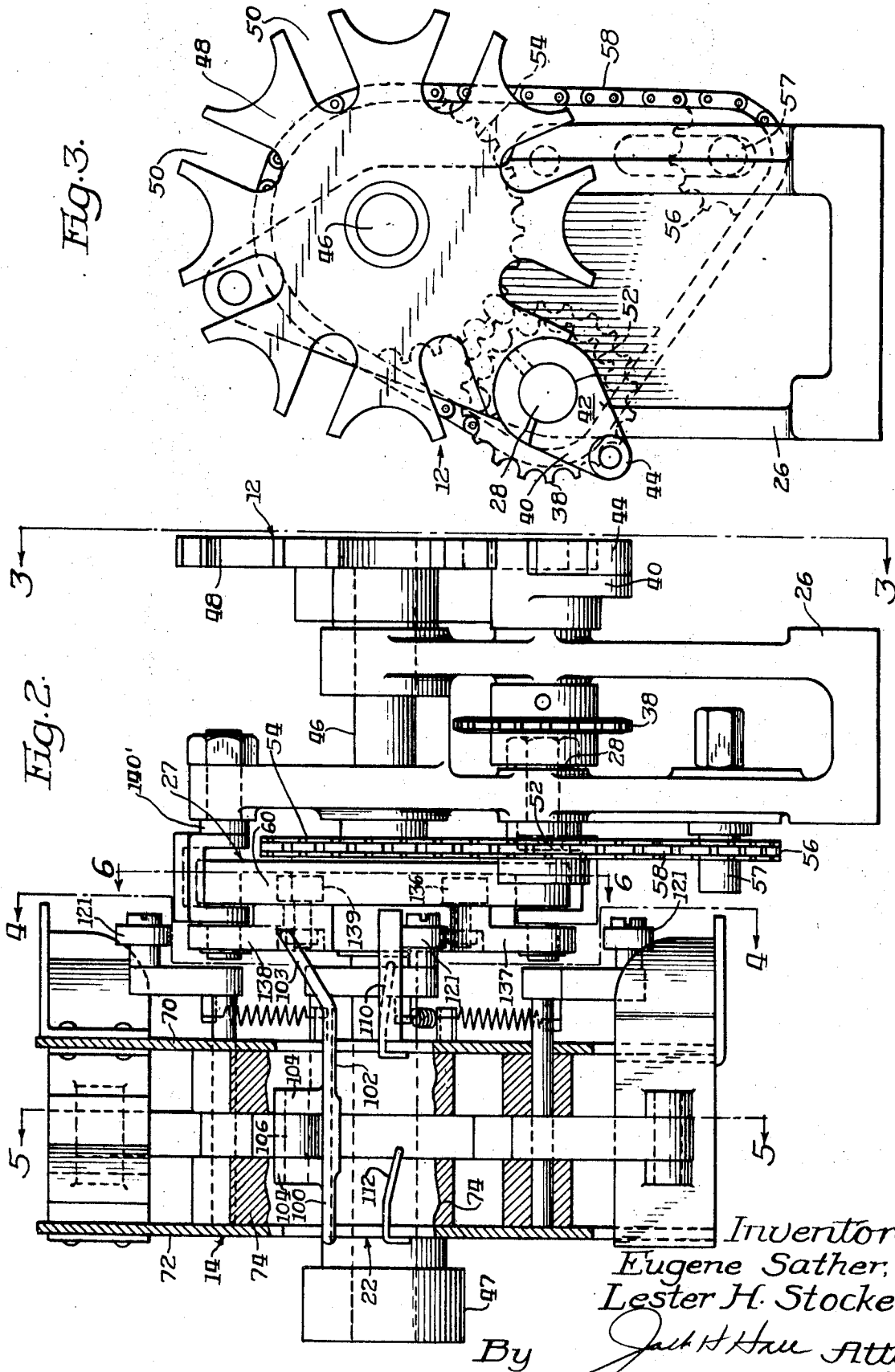
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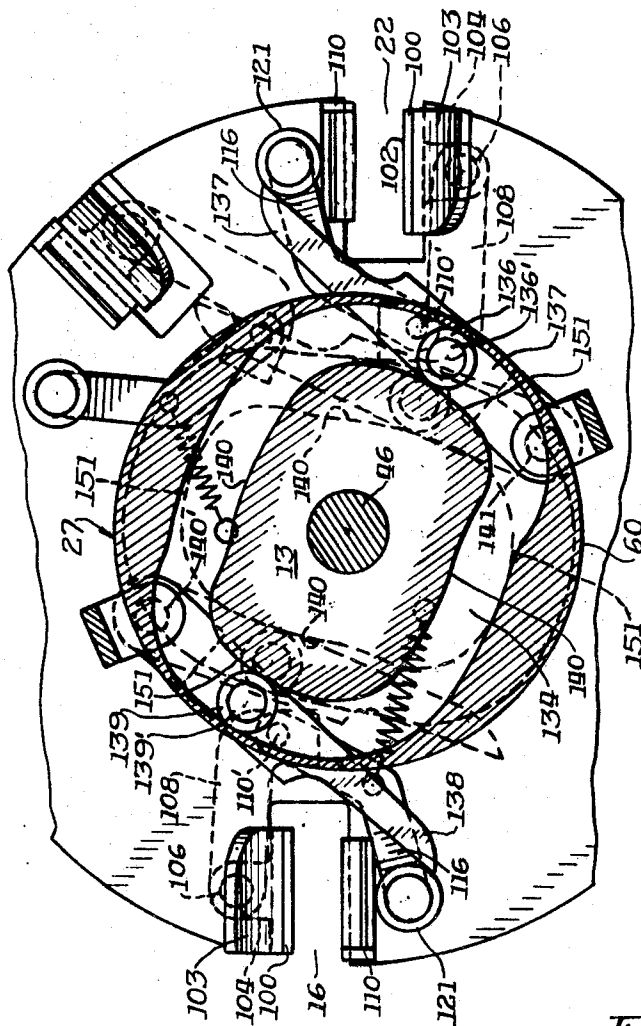
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Fig. 6.



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ENVELOPE TURNOVER APPARATUS

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5 Claims

ABSTRACT OF THE DISCLOSURE

This invention is directed to rotary article turnover apparatus for use with mail handling or similar equipment for turning over articles such as envelopes from an address side down condition to an address side up condition. The turnover apparatus includes a drum shaped envelope carrier having a number of pockets equally spaced about its circumference and a clamping jaw at each pocket adapted for movement parallel to the envelope for holding the envelope without distortion while the carrier is successively cycled through an angle of 180°. The envelope carrier is supported for movement about a horizontal axis and is cycled and intermittently rotated through a given angle per operational cycle by a Geneva drive which is dimensioned so as not to interfere with movement of the envelope toward the carrier. Cam means including an integral cam track receiving a pair of cam followers is provided for opening and closing the clamping jaws during stationary portions of the operational cycle to release an envelope at a receiving station and for clamping and picking up an envelope at a supply station.

FIELD OF THE INVENTION

This invention relates in general to mail handling apparatus for reorienting envelopes or other articles. In particular, this invention relates to rotary apparatus for use with mail handling equipment for turning over envelopes from an address side down condition to an address side up condition, or vice versa, prior to continued conveyance of the envelope to a subsequent operating station.

DESCRIPTION OF THE PRIOR ART

One form of mail handling equipment inserts letters, bills or other articles into envelopes with the rear or flap side of the envelope facing upwardly and the address or front side of the envelope facing downwardly. The stuffed envelope is then conveyed or transported to a flap sealing station with its flap side still facing upwardly. However, in the above described mail handling equipment, the postage apparatus for applying the proper postage to the letter operates on the upper surface of the letter thus, the envelope must be flipped or turned over to properly present its address side to the postage applying apparatus. Consequently, in this type of mail handling equipment, apparatus is required between the flap sealing and the postage station for reorienting the envelope by turning or flipping it from a backside up condition to a front side up condition.

With the ever increasing volume of outgoing mail being handled by offices and factories, the operating speed of mail handling equipment has been greatly increased in order to process the mail in a shorter period of time and with less effort on the part of the user. However, the high processing speeds impose relatively high inertial forces on the equipment and the envelopes. These forces become more severe as a function of the degree to which the articles are reoriented. This is especially apparent in apparatus for reorienting articles through a large angle of 180° as is necessary to properly reorient the envelopes in the above described mail handling apparatus.

Various means have been devised for reorienting en-

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velopes and similar articles either through a horizontal or a vertical plane, including elaborate and complicated configurations of belts, suction devices, and clamps. Many of these devices only operate at inadequately slow speeds, are susceptible to jamming and are unreliable due to the inability to securely hold or clamp the article without distorting it. The result of the latter deficiencies is that the inertial forces acting on the article cause it to slip from the clamp and be thrown from the device. The possibility of loss of articles operated on by such prior art turnover devices is a serious problem.

SUMMARY OF THE INVENTION

This invention obviates many of the problems and difficulties of prior art envelope turnover devices by providing a drum shaped envelope carrier, means rotatably mounting the carrier for movement about a horizontal axis, and Geneva drive means for cycling and intermittently rotating the envelope carrier through a given angle per operational cycle. The carrier includes an even number of pockets equally spaced about its circumference. The pockets form a number of diametrically opposite pocket pairs, each pocket being suitable for accommodating one or more envelopes. Each pocket includes a clamping jaw and an associated jaw operating lever which enables each jaw to close parallel to the envelope received in the particular pocket for clamping and holding the envelope without distortion while the carrier is successively cycled through an angle of 180°.

Cam means including a pair of cam driven follower fingers are provided adjacent the carrier for actuation of the jaw operating levers. Operation of the cam and movement of the follower fingers are timed so that during the stationary portion of each operation cycle, the clamping jaws positioned adjacent the supply station whereat envelopes are supplied to the carrier is opened for placement of the envelope therein and is then closed to hold the envelopes in the carrier pocket. Simultaneously, the diametrically opposite jaw at the receiving station is opened to unclamp and release a turned over envelope which was picked up during a previous operational cycle. The turned over envelope is now properly oriented for delivery to the postage meter.

The Geneva drive member is manufactured with a small wheel diameter to prevent interference between it and the envelopes as the latter are delivered to the supply station.

The envelope carrier is fabricated of a pair of spaced apart side walls carried on a central flange and is generally hollow adjacent its periphery to reduce the rotational inertial forces which normally result from its high operational speed.

Accordingly, the primary object of this invention is to provide apparatus for rapidly and reliably reorienting envelopes or similar articles from an address side up condition to an address side down condition or vice versa.

Another object of this invention is to provide means for use in mail handling apparatus for rapidly and reliably turning over envelopes or similar articles.

An additional object of this invention is to provide apparatus for rapidly turning over a large number of envelopes without creasing or otherwise distorting or damaging the envelopes and without jamming or spilling the envelopes from the apparatus. It is also an object of this invention to provide an envelope turnover device including an intermittently rotatable drum or carrier having a plurality of pockets for accommodating the envelopes and a jaw in each pocket for clamping the envelope wherein each jaw is moved substantially parallel to the envelope for firmly grasping and holding it without damage.

An additional object of this invention is to provide envelope turnover apparatus including a rotatable carrier having a number of pockets for accommodating the en-

velopes, jaw means for clamping the envelopes in the pockets, and cam means adjacent the carrier for cooperating with the jaw means to reliably and accurately open and close the jaws of those carrier pockets adjacent the supply and receiving stations.

Another object of this invention is to provide envelope turnover apparatus including envelope carrier driving means wherein lost motion of the driving means is substantially eliminated for rapid and reliable operation of the apparatus.

Additional objects of this invention will become apparent to those versed in the art upon an understanding of the following detailed description of the turnover apparatus of the invention taken in conjunction with the accompanying drawings in which the preferred embodiment of the invention is shown, and wherein:

FIG. 1 is a top plan view of the envelope turnover apparatus of the invention including transport means for supplying envelopes to the turnover apparatus, second transport means for removing the turned over envelopes, and showing envelopes at the various stages of being turned over by the apparatus;

FIG. 2 is an enlarged elevational, partial cross-sectional view of the turnover apparatus of the invention taken generally along offset section line 2—2 of FIG. 4;

FIG. 3 is an elevational right side view of the Geneva drive shown in FIG. 2 for intermittently rotating the envelope carrier;

FIG. 4 is a slightly reduced elevational view of the right exterior side of the envelope carrier taken along offset section line 4—4 of FIG. 2;

FIG. 5 is a slightly reduced, elevational partial cross-sectional view of the envelope carrier as generally viewed through its center perpendicular to its axis of rotation along section line 5—5 of FIG. 2;

FIG. 6 is an enlarged elevational, partial cross-sectional view of the jaw operating cam and its associated structure as viewed generally perpendicular to its axis of rotation along section line 6—6 of FIG. 2. The full line representation depicts the position of the cam and its follower fingers when the jaws are opened, while the dotted line representation shows the position of the elements when the jaws are closed.

Turning now to the drawings, and in particular FIG. 1, the turnover apparatus 10 of the invention is seen to include a Geneva drive 12 for intermittently driving a rotatably mounted envelope carrier 14 and for indexing the carrier during each operational cycle. The carrier is indexed in a manner such that a first envelope pocket 16 of the carrier is positioned at the level of an envelope supply station 18 of a raceway 19 having a supply chain 20 and such that a second pocket 22 is positioned at the level of a receiving station 24 of a receiving raceway 25 which includes a transport belt 26. A pair of transport rollers 127 and 127' are provided above belt 26 in the direction of its movement to assist in removing the envelopes from the receiving station.

Pocket 16 and 22 comprise a diametrically opposed pocket pair. It is obvious that although the illustrated embodiment is adapted for use with parallel, spaced apart raceways, the apparatus may also be used with other raceway arrangements.

The invention also includes a cam assembly 27 for opening the jaws at the supply and receiving stations for picking up an envelope at the supply station and releasing it at the receiving station, and for closing the jaws while the pockets are disposed at intermediate positions during movement of the carrier.

Referring now to FIGS. 2 and 3, an upstanding frame member 26 is provided for supporting the Geneva drive 12, the cam assembly 27, and the envelope drum or carrier 14. A primary drive shaft 28 is journaled in and extends between spaced apart left and right legs of frame 26. Shaft 28 carries a sprocket 38 about which a drive chain, not shown, may be trained for transmitting driving

power from a main table drive shaft, also not shown. A Geneva crank 40 is staked to the right end of shaft 28 and includes a crank arm 42 having a roller 44 at the end thereof. A secondary drive shaft 46 is journaled for rotation above and parallel to primary shaft 28.

A Geneva wheel 48 having eight circumferentially equally spaced radial indexing slots 50 is staked to the extreme right end of upper shaft 46. Slots 50 are positioned for engagement by roller 44 to effect a well known Geneva drive. The diameter of Geneva wheel 48 is substantially smaller than the diameter of carrier 14 to prevent interference between the wheel and the envelopes as the latter are supplied to the carrier. Slots 50 are sized to provide firm engagement with roller 44 to eliminate lost motion in the drive chain.

Operationally, for each complete revolution of sprocket 38 and crank 40, Geneva wheel 48 is rotated one-eighth of a revolution or 45°. However, the wheel is rotated only during a minor portion of each operational cycle and remains stationary during the greater portion of each cycle to effect intermittent motion. The envelope carrier 14 is fixedly secured to an extension of the left end of upper shaft 46 between a left end bearing 47 and frame 26 for exact movement with Geneva wheel 48 thus, carrier 14 is also rotated one-eighth of a revolution for each full revolution of crank 40, and also remains stationary during the greater portion of each operational cycle.

A small cam driving sprocket 52 is secured to the extreme left end of primary drive shaft 28 outwardly of the left leg of frame 26. A large cam sprocket 54 is journaled on secondary drive shaft 46 to the left of frame 26, and a jaw cam 60 is secured to the left side of the large sprocket, between the sprocket and carrier 14. The cam and large sprocket are both journaled for rotational movement relative to shaft 46. A vertically adjustable idler sprocket 56 is journaled on a shaft 57 in the frame left leg, in front of and below the driving sprocket. A cam drive chain 58 is trained over each of sprockets 52, 54 and 56 for transmitting rotational motion to the jaw cam. Thus, for each complete revolution of primary drive shaft 28, carrier 14 is driven one-eighth of a revolution by the Geneva drive, and cam 60 is rotated one-half revolution through drive chain 58 and the 2:1 reduction between sprockets 52—54. The relative movement and the timing between cam 60 and carrier 14 is required to open and close one pair of carrier jaws during the stationary portion of each operational cycle.

Referring now additionally to FIGS. 4 and 5, envelope carrier 14 is generally drum shaped and is fabricated of a generally flat, circularly shaped right side wall 70, a similarly shaped left side wall 72 which is spaced away from the right wall in an axial direction, and a center hub 74 having an irregularly shaped hub flange 76. The hub and flange extend between the inner surface of the left and right side walls and the walls are secured to the flanges by screws 77. A square key 78 is provided for securing hub 74 relative to shaft 46.

Right carrier wall 70 is relieved or cut out at eight circumferentially spaced locations 80 at its periphery. Left carrier wall 72 is similarly relieved or cut out at eight identical locations 82 at its periphery so that the cutouts 80 and 82 of walls 70 and 72, respectively, are aligned in a direction parallel to the axis of rotation of the carrier member thereby forming eight pockets consisting of pockets 16 and 22 referred to above, and additional pockets 84, 86, 88, 90, 92, and 94. Each pocket is suitable for accommodating one or more envelopes. The eight pockets form four diametrically opposite pocket pairs thus pockets 16—22 form one pair, pockets 98—84 form another pair, etc. While eight envelope pockets are shown in the illustrated embodiment, it is obvious that a greater or lesser number of pockets may be employed and that an even number of pockets is not absolutely necessary, although an even number of pockets is preferred in order to supply or feed an envelope to the carrier and remove

a turned over envelope from the carrier during each operational cycle.

In accordance with the invention, a clamping jaw and jaw operating means are associated with each carrier pocket. For convenience of description, a single jaw 100 associated with pocket 22 and its operating means will be described in detail. The clamping jaw structure and the operating means of each of the other pockets are identical.

As best seen in FIGS. 2, 4, and 5, clamping jaw 100 comprises a jaw plate 102 having a bent end 103 for guiding envelopes into the pocket at the receiving station 18. The jaw also includes a stem 104 which is pivotally connected to one end of a L shaped arm 108 by pin or rivet 106. Arm 108 is housed between side walls 70 and 72. The other end of arm 108 is clamped about the center of a shaft 110' having its ends journaled in flange 76. By rotating shaft 110' through an angle of approximately 30°, clamping jaw 100 is caused to move toward and away from a pair of stationary guides 110 and 112 secured to the opposite side of pocket 22 on walls 70 and 72 respectively. Guides 112 and 111 are formed so as to form an acute angle with portion 103 to assist in proper placement of the envelope into the pocket. In addition to arm 108, a substantial portion of jaw 100 is carried between side walls 70 and 72 of the envelope carrier.

It should be particularly noted that the pivotal mounting of each jaw to its arm and the manner in which each arm is mounted with respect to its operating structure, provides parallel movement between the jaw plate and the envelope. This movement prevents damage to the envelope while allowing the envelope to be tightly clamped in the pocket to prevent loss thereof at the high operational speed of the carrier.

The right end of shaft 110' extends through an opening formed in right side wall 70. An angularly shaped jaw operating lever 116 is provided having a first end 118 staked to the right end of shaft 110' and having a second end 120 carrying a rotatably mounted wheel or roller 121. Jaw operating lever 116 defines a small opening for receiving one end of a tension spring 124. The other end of the tension spring is secured to a stud 126 extending from the surface of wall 70. Tension spring 124 functions to bias jaw operating lever 116, shaft 110' and jaw arm 108 in the counter-clockwise direction as seen in FIGS. 4 and 5, causing the jaw to normally assume its closed position for clamping an envelope in the pocket. Each of the other clamping jaws, arms and jaw operating levers operate in the exact same manner as the structure described above in connection with carrier pocket 22.

By means of the above described structure, each of the clamping jaws may be readily actuated from a location outwardly of the envelope carrier 14, rather than requiring complex operating apparatus for actuating the jaws from a location interior of the carrier.

Turning now to the cam assembly 27 of the turnover, as best seen in FIGS. 2 and 6, and as noted above, cam 60 and cam sprocket 54 are mounted on upper shaft 46 for rotational movement relative thereto and relative to frame 26. Cam 60 includes an integral cam track on channel 134 which receives a pair of cam followers for controlling movement of a pair of actuating fingers as described in greater detail immediately below.

A pair of elongated cam actuating fingers 137 and 138 are pivotally journaled on U shaped laterally extending collars 140' and 141 respectively, each permanently attached to frame 26. Cam actuating finger 137 includes a stud 136' for rotatably supporting a cam follower roller 136 and cam actuating finger 138 similarly includes a stud 139' and a cam follower roller 139. The cam follower rollers ride in and are captivited by cam track 134 thus, rotation of the cam imparts outward and inward pivotal movement to each of the actuating fingers in accordance with the profile of cam track 134. As seen in FIG. 6, the

position of the fingers when pivoted outwardly is shown in solid lines, while the inward pivoted position is shown in phantom.

Control of the finger movements by captivating the follower rollers eliminates the need for return springs and obviates the possibility of breakage and jamming with resultant damage to the apparatus. Fingers 137 and 138 are of sufficient length so that the ends thereof engage wheels 122 of jaw operating levers 116. Specifically, the two fingers respectively engage two diametrically opposite jaw levers 116, such as the levers which cooperate with carrier pockets 16 and 22, so that the clamping jaws thereof are simultaneously opened in timed sequence with stationary positioning of the carrier 14 by Geneva drive.

The profile of cam track 134 is designed so that for each one-half revolution of cam 60, each actuating finger 137-138 cooperating with its respective jaw operating lever 116 will actuate the lever to open each jaw 100, and will subsequently release each lever to allow tension spring 124 to close the jaws. Movement of the jaws takes place once per operational cycle, but only during the period when the carrier is stationary. Thus, the jaw at pocket 16 is opened to allow an envelope, such as envelope 142, to be transported into the pocket whereupon the jaw closes and similarly, the jaw at pocket 22 is opened to allow a turned over envelope 143 to be removed from the pocket.

MODE OF OPERATION

As described above, a number of pairs of pockets are provided at the circumference of carrier 14, each suitable for accommodating one or more envelopes or similar articles which it is desired to turn over. Since the envelope supply station and receiving station are disposed on generally parallel planes and on diametrically opposite sides of the carrier 14, the carrier must rotate through an angle of 180° in order to turn over each envelope. This is accomplished in four stages or cycles, each cycle comprising, in sequence, movement of the carrier through one-eighth of a revolution, termination of carrier movement, and opening and closing of each jaw adjacent to the envelope supply and receiving stations to permit insertion and removal of the envelopes.

During the portion of the cycle at which the carrier is stationary, follower rollers 136-139 of cam fingers 137-138 cooperate with a dwell portion 140 of cam track 134 and the fingers are retracted as shown in phantom in FIG. 6. In their retracted positions the cam fingers do not cooperate with follower wheels 122 at the ends of jaw operating levers 116. As the cam 60 rotates through an angle of approximately 90° the cam fingers are removed outwardly to an extended position by the high portions 151 of the cam track thereby actuating each of the adjacent levers 116 and arms 108 through an angle of about 30° and opening the respective jaws 100. With the jaws in their opened or unclamped positions, envelope 142 is placed in pocket 16 at envelope supply station 18 by chain conveyor 20. Simultaneously turned over envelope 143 is removed from pocket 22 at receiving station 24 by conveyor belt 26 and wheel 27. Further movement of cam 60 returns operating fingers 138 to their retracted positions and tension springs 124 return operating levers 116 and jaw arms 108 to their normal positions, firmly closing the jaws to retain the envelopes in the pockets. During operation of the carrier, the four upper pockets are occupied by envelopes while the four lower pockets are empty.

While the turn over apparatus may be operated at various speeds, a suggested design speed of the illustrated embodiment is approximately 168 cycles per minute. While this is not necessarily the limit for the device, this speed is compatible with the particular mail handling equipment for which it was designed.

It is obvious that upon study by those skilled in the art, the disclosed invention may be altered or modified

both in physical appearance and construction without departing from its inventive concept. Therefore, the scope of protection to be given in this invention should not be limited by the embodiment described above, but should be determined by the essential description thereof which appear in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In an article turnover device for rapidly turning over articles delivered thereto, including: a frame; a carrier mounted on said frame for movement about a horizontal axis including a plurality of pockets at its circumference for accommodating said articles; drive means intermittently rotating said carrier and stationarily indexing the carrier between periods of rotation such that one pocket thereof is positioned at an article supply station and another pocket is positioned at an article receiving station; means for transporting an article into the carrier pocket at the supply station and for removing a turned over article from the carrier pocket at the receiving station; a clamping jaw associated with each of said carrier pockets for clamping the article received at the supply station and supporting it relative to the carrier while the carrier is rotated through an angle sufficient to position the article at the receiving station; cam means cooperating with the clamping jaws at the supply and receiving stations to close the jaw at the supply station thereby clamping said article in the carrier pocket, and to open the jaw at the receiving station thereby releasing the turned over article for removal from the carrier pocket; the improvement comprising: means movably mounting each of said clamping jaws in a manner such that each of said jaws remain parallel to said article whereby said article is firmly clamped in the carrier pocket without damage thereto during rotational movement of the carrier.

2. The article turnover device as set forth in claim 1 wherein said cam means comprise a jaw cam member supported for rotation by said frame and mounted adjacent said carrier for rotational movement relative thereto, and a pair of cam follower fingers pivotally mounted on said frame adjacent the cam member and positioned for cooperation and movement thereby; each of said clamping jaws including a jaw operating lever pivotally mounted exteriorly of the carrier inwardly adjacent the periphery thereof and positioned for selective operational engagement by said fingers; whereby during a stationary portion of each operational cycle, only the operating levers of those jaws disposed at the supply and receiving stations are engaged by the cam fingers to open the jaws.

3. The article turnover device as set forth in claim 2, wherein said carrier drive means comprise a Geneva drive

including a driven Geneva wheel having a plurality of slots equal to the number of carrier pockets and having a maximum radius less than the smallest radial dimension of the carrier pockets as measured from the center of rotation of the carrier to said pockets, thereby preventing interference between the articles and the Geneva wheel as the articles are transported to said carrier.

4. The article turnover device as set forth in claim 3 wherein said cam jaw member defines an integral cam track having a given profile for receiving and captivating a portion of the cam follower fingers thereby controlling movement of the follower fingers for opening and closing the cam jaws.

5. In an article turnover device for rapidly turning over articles delivered thereto, including: a frame; a carrier mounted on said frame for movement about a horizontal axis including a plurality of pockets at its circumference for accommodating said articles; drive means intermittently rotating said carrier and stationarily indexing the carrier between periods of rotation such that one pocket thereof is positioned at an article supply station and another pocket is positioned at an article receiving station; means for transporting an article into the carrier pocket at the supply station and for removing a turned over article from the carrier pocket at the receiving station; a clamping jaw associated with each of said carrier pockets for clamping the article received at the supply station and supporting it relative to the carrier while the carrier is rotated through an angle sufficient to position the article at the receiving station; cam follower means cooperating with each of the clamping jaws at the supply and receiving stations to close the jaw at the supply station thereby clamping the article in the carrier pocket and to open the jaw at the receiving station thereby releasing the article for removal from the carrier pocket; the improvement comprising: jaw cam means defining an integral cam track having a given profile for receiving and captivating said cam follower means thereby controlling movement of the follower means in accordance with the cam profile for opening and closing the cam jaws.

References Cited

UNITED STATES PATENTS

1,217,923	3/1917	Donnelly	-----	198—33ADX
3,319,805	5/1967	Brauer	-----	214—1BD

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