

Jan. 19, 1971

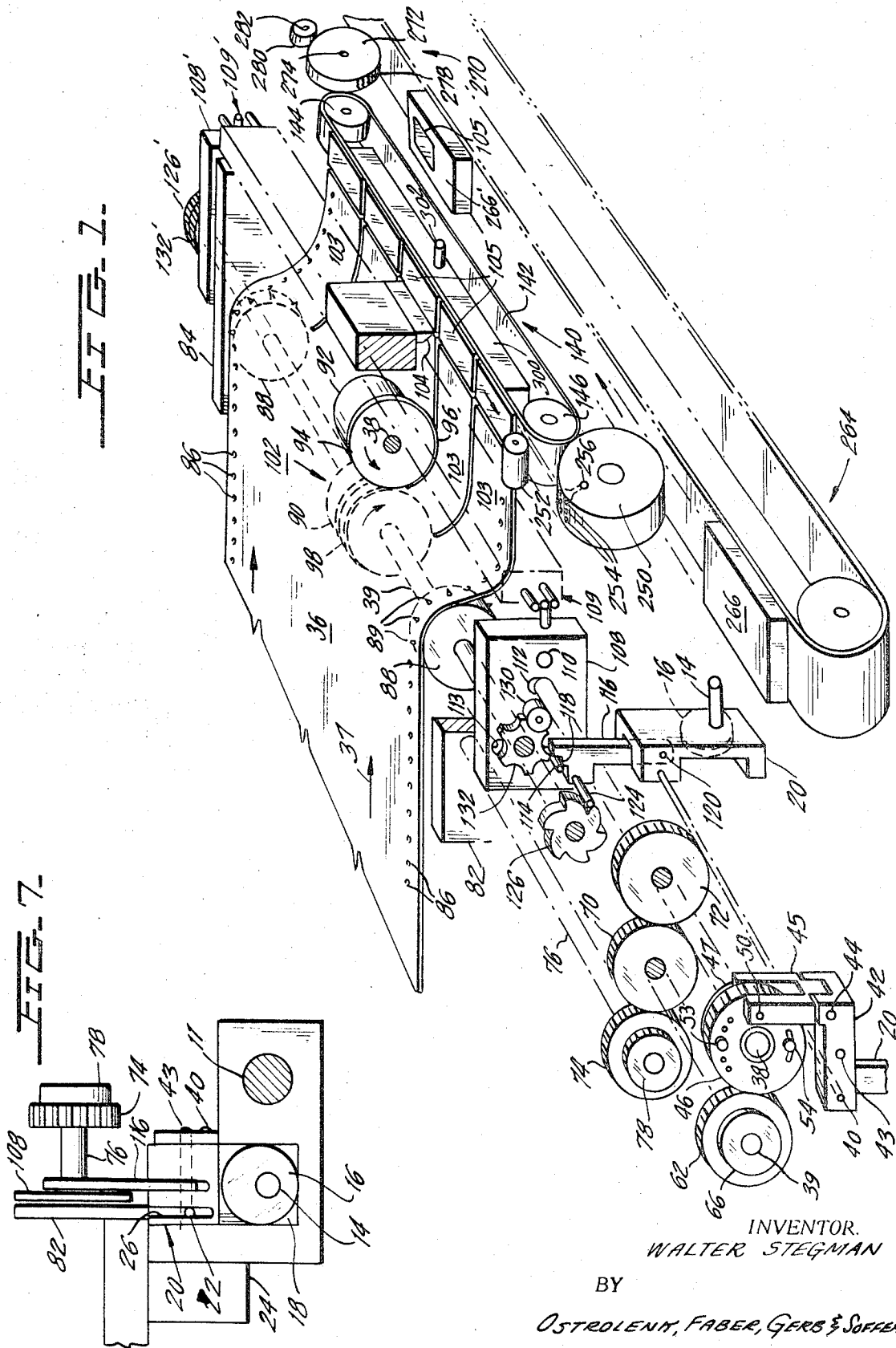
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3,556,909

APPARATUS FOR LABEL CUTTING AND APPLICATION

Filed June 30, 1969

3 Sheets-Sheet 1



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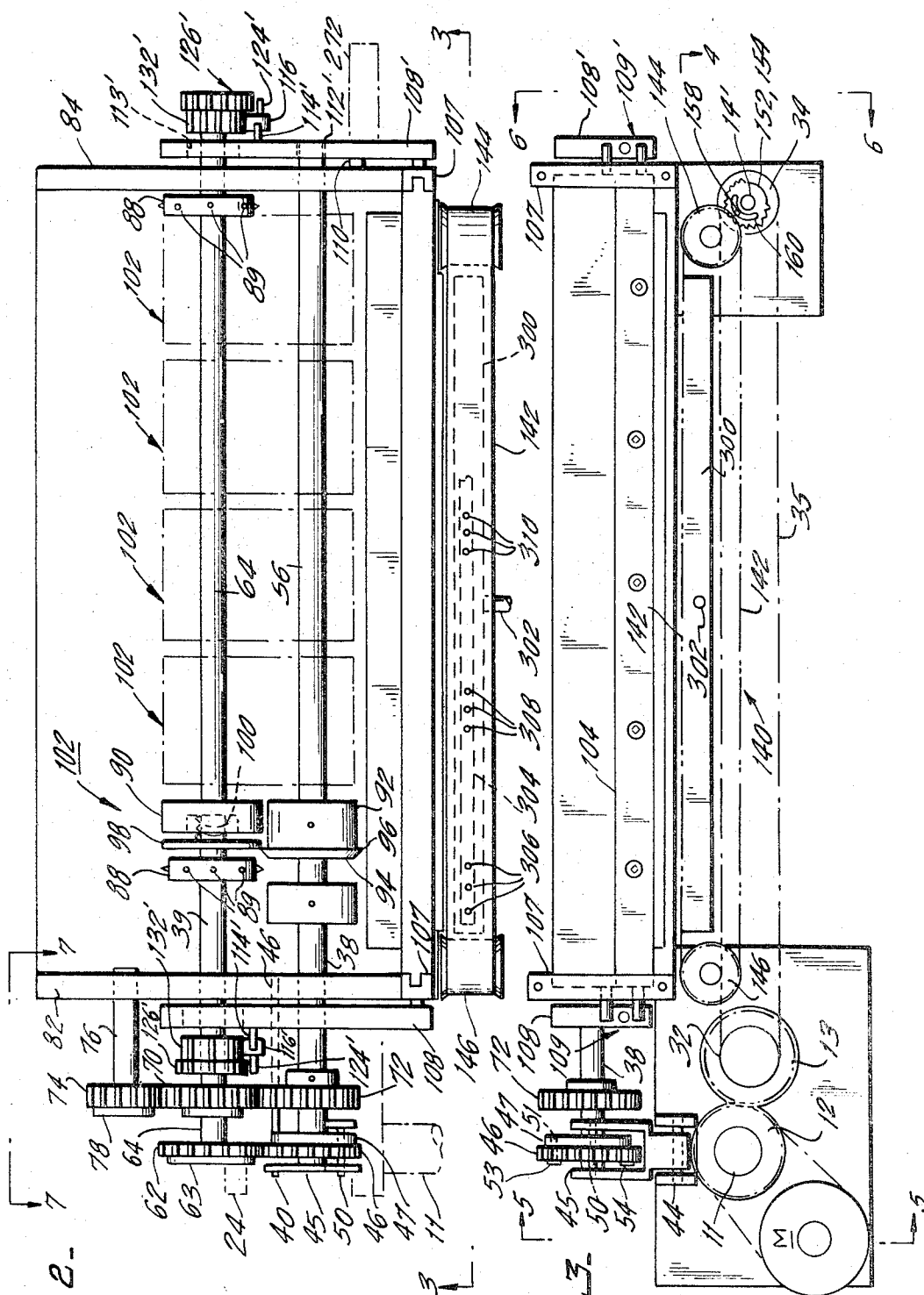
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APPARATUS FOR LABEL CUTTING AND APPLICATION

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3 Sheets-Sheet 2



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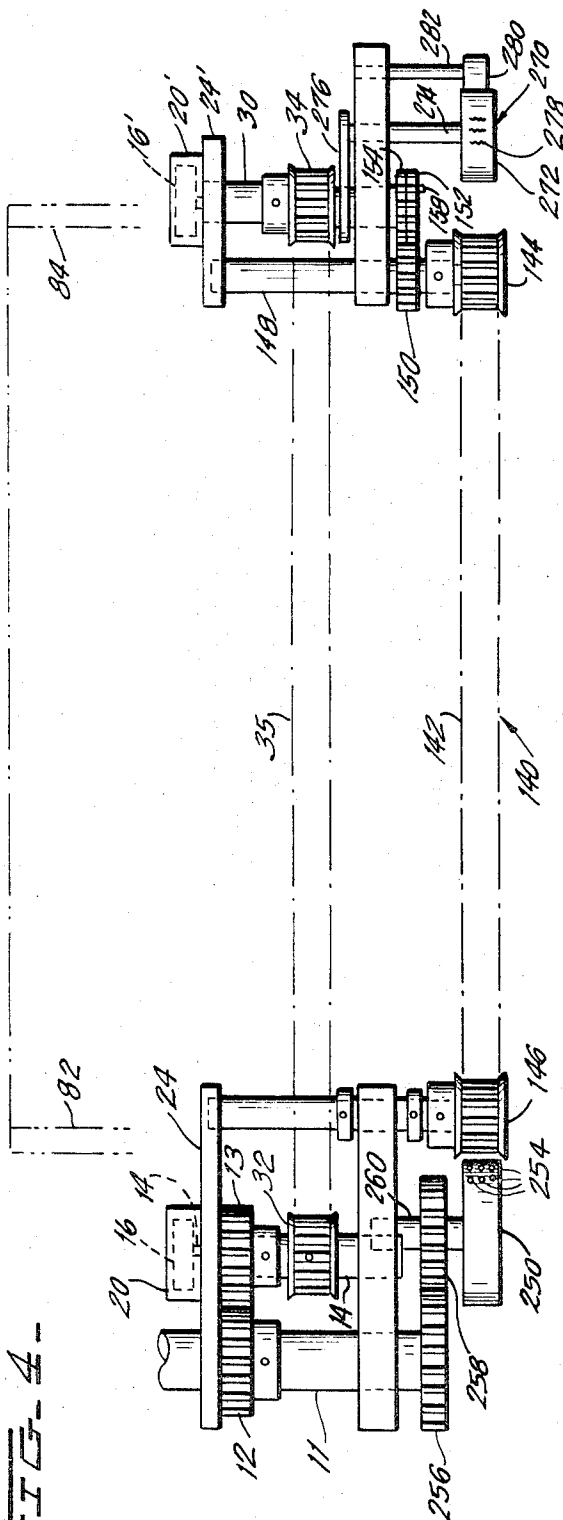
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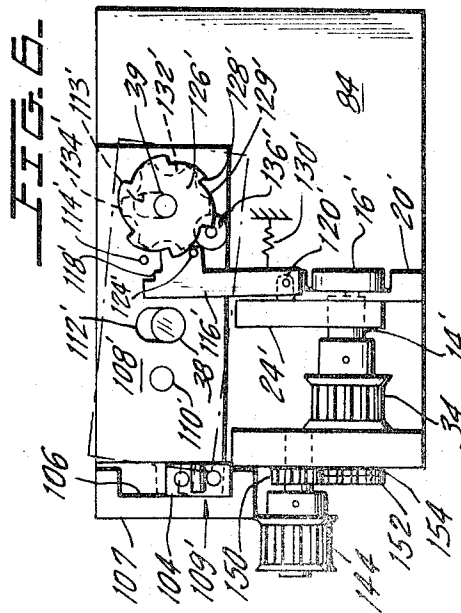
APPARATUS FOR LABEL CUTTING AND APPLICATION

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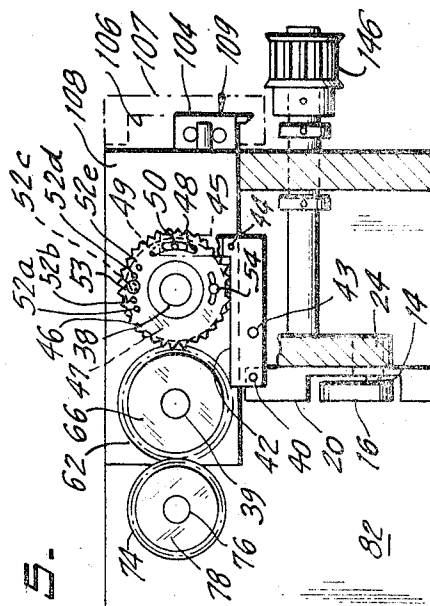


Figure 1. Schematic diagram of the experimental setup. The subject is seated in a chair, viewing a screen displaying a target (a red dot) and a starting point (a black dot). The subject's hand is positioned at the starting point, and the distance between the starting point and the target is indicated by a horizontal line. The subject is instructed to move the hand from the starting point to the target.

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21 Claims

ABSTRACT OF THE DISCLOSURE

A sheet of labels, each of which labels is to be applied to a separate item, is moved past a first knife means which slits the sheet forming separate columns of labels; a second knife which cuts off one horizontal row of labels at a time; a transport, onto which individual labels settle after they have been cut, to transport the labels to an applicator which applies each label to an item to be labelled; and adjustable cam and lever controlled means for coordinating the movement of the sheet, the operation of the second knife which cuts the rows of labels from the strip columns, and the transport for transporting individual labels to the applicator, so that the labels will be cut off and transported properly, regardless of the number of columns of labels.

BACKGROUND OF THE INVENTION

This invention relates to an apparatus for cutting individual labels from a sheet and for applying each label to an item adapted to receive it.

High speed, large volume labelling is prevalent in bulk mailing, mailing of publications, etc. With a bulk mailing, frequently, all of the different addresses are placed, spaced apart, on a continuous sheet of paper, with the individual addresses arrayed in columns extending the length of the sheet, and with each horizontal row of addresses across the columns being aligned. Typically, such a sheet would be a print out from an information storage apparatus.

Means are provided in the prior art to automatically cut the continuous sheet of spaced apart addresses into individual labels by cutting the sheet vertically to separate the columns and horizontally to separate the rows. Then each individual label is transported to and applied to an individual one of the items to be labelled.

One major consideration in the design of a label cutting apparatus is that the number of columns of labels may vary, usually between one and six columns, among different sheets of labels. Therefore, not only must the operations of the label cutting knives and the label transport be coordinated, but the operations must be readily adjustable in the field as label sheets having different numbers of columns are provided.

In the prior art, adjustability is obtained through the use of complex gear arrangements, with different gears having to be substituted by an operator in the field as the numbers of columns of labels change. Not only is the mechanism extremely complex, which increases both the number of places at which there can be a breakdown and the time required for repair, but the operation of the apparatus is difficult with many gears having to be changed manually.

Furthermore, most prior art label cutting and application apparatus cut the label sheets first across a horizontal row. Then, an entire uncut horizontal row of labels is transported toward the label applicator. In the immediate vicinity of the applicator is a means for cutting individual labels away from the row. The resulting clutter in the immediate vicinity of the applicator makes repair in the field much more difficult.

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The label cutting and application apparatus of the present invention accomplishes all that prior art apparatus do, and overcomes their drawbacks. Briefly, the sheet of labels is moved past a cutting device which cuts the sheet into columns of labels. The sheet then moves under a guillotine knife which cuts off individual rows of labels. Since the sheet has already been cut into columns, when a row is cut, individual labels are formed. After the individual labels are cut, they settle onto a transport which carries them to the label applicator, which, in turn, applies each label to an item (e.g. a magazine) intended to receive it. Note that the labels have been cut at a location remote from the label applicator.

There must be proper coordination of the operation of all of the various subassemblies of the label cutting and application apparatus. The label applicator applies labels to items to be labelled at a predetermined frequency, which would depend upon the speed at which the items to be labelled could be moved past the label applicator without being destroyed, wrinkled, etc. Naturally, for most economical operation, the items to be labelled should move as rapidly as possible. The transport which brings the labels to the applicator must feed the labels at a constant frequency, each label being ready each time the applicator device has moved through its cycle of operation into position to receive a label.

Because labels must be applied at a constant rate and must be fed to the applicator at a constant rate, there is a basic problem that must be solved with every label cutting and application apparatus. A sheet of labels may consist of any number of columns of labels, usually in the range of from one to six in number. When there is but one column of labels on a sheet, for each cycle of operation of the label applicator (a cycle being comprised of the steps of picking up a label from the label transport, applying the label to an item to be labelled, and returning to the pick up positions), one horizontal row of labels must be cut from the sheet.

If there are two columns of labels, when a single horizontal row of labels has been cut, two separate labels have been formed and settle on the label transport, whereby two cycles of the label applicator must be completed before labels from the next horizontal row of labels can be received by the label applicator. Since the label applicator operates at a constant rate, and since it takes twice as long for the two labels from a single horizontal row of a two column sheet of labels to be used up than it does for a single horizontal row of a single column sheet of labels to be used up, the two column label sheet must travel toward the horizontal row cutting knife at half the speed of the one column label sheet, in order to provide labels at the correct rate.

The frequency of operation of the row cutting knife must be proportionately reduced so that it does not make a cut until a new row of labels is in position to be cut off. The frequency of operation of the horizontal row cutting knife and the speed of movement of the label sheet must be proportionately still further reduced as the number of columns increases.

The present invention provides a simple and easily adjustable lever and cam arrangement, as compared with the complex gear arrangements of the prior art, for varying the speed of the label sheet and the frequency of the knife cuts. A simple adjustment of the distance travelled by one of the drive gears of the apparatus, accomplished, for example, through a lost motion connection, provides the necessary variations in sheet travel rate and row cutting knife operation frequency.

The label transport, which carries cut labels to the label applicator, must have its operation coordinated with the number of columns of labels and the width of each column. Depending upon the width of a column

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of labels, which determines the width of a label and thereby determines the spacing between adjacent labels after they have been cut from the sheet and have settled on the transport, the transport must move each label a particular distance to deliver it to the applicator. To control the travel distance, the label transport is provided with a drive means for starting it and for then halting it after it has travelled the required distance. The transport drive means would be connected with, to have its motion coordinated with, the label applicator to which the transport must deliver labels properly. The means for starting and stopping the transport may be a sector gear connected with the transport drive means and having the angular length of its toothed operative surface being adjustable to control the distance travelled by the transport during each cycle.

Accordingly, it is the primary object of the present invention to provide an improved apparatus for cutting and applying labels.

It is another object of the present invention to provide such an apparatus which operates rapidly.

It is another object of the present invention to provide such an apparatus which is much simpler than similar apparatus in the prior art.

It is a further object of the present invention to provide such an apparatus, the operation of which can be readily adjusted as the numbers and widths of the columns on the label sheets vary.

It is another object of the present invention to accomplish the foregoing through the use of a lever and cam arrangement, as opposed to complex gear means.

It is a further object of the present invention to accomplish the foregoing through the use of a lost motion connection device.

It is still another object of the present invention to provide such an apparatus which may be easily repaired and which is less likely to break down.

It is a further object of the present invention to provide such an apparatus where the cutting of the labels is performed remote from the label application device, thereby avoiding clutter.

It is another object of the present invention to provide such an apparatus where all of its operations are properly coordinated.

These and other objects of the present invention will become apparent when the following description is read in conjunction with the accompanying drawings, in which:

FIG. 1 is an exploded perspective of an apparatus designed in accordance with the present invention;

FIG. 2 is a top, assembled view of the apparatus of FIG. 1;

FIG. 3 is a view in the direction of the arrows 3—3 of FIG. 2;

FIG. 4 is a view in the direction of arrows 4—4 of FIG. 3 showing some of the operating elements of the label cutting and application apparatus;

FIG. 5 is a view in the direction of arrows 5—5 of FIG. 3;

FIG. 6 is a view in the direction of arrows 6—6 of FIG. 3; and

FIG. 7 is a fragmentary view of the apparatus in the direction of arrows 7—7 in FIG. 2.

The apparatus of the present invention performs four functions. It cuts a sheet of labels into vertical columns; it cuts the columns horizontally into rows, thereby forming individual labels; it transports the individual labels to the label applicator and it applies each label to an item to be labelled.

APPARATUS DRIVE MEANS

Conventional motor M in FIG. 3 drives main drive shaft 11 of the apparatus.

Turning to FIG. 4, gear 12 is fixedly secured to shaft 11 and meshes with gear 13 which is fixedly secured to shaft 14. Also secured to shaft 14 is eccentric cam 16,

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shown more clearly in FIG. 7. Eccentric cam 16 is positioned within the receiving slot 18 of plunger 20. Rotation of drive shaft 11 rotates shaft 14 which rotates eccentric cam 16, thereby causing plunger 20 to reciprocate up and down, as viewed in FIG. 7. Stud 22, which is secured to the machinery support frame element 24, rides in the guide slot 26 of the plunger 20 as the plunger reciprocates. Reciprocation of plunger 20 controls both the speed of travel of sheet 36 and the cutting frequency of guillotine knife 104, as discussed below.

Cam 16 and plunger 20 are at the left end of the apparatus in FIG. 4. There is an identical eccentric cam 16' and plunger 20' at the opposite end of the apparatus, but it only aids in controlling the row cutting knife 104, as also considered below. Eccentric cam 16' is fixedly secured to its own rotatable shaft 30. Shaft 30, as discussed below, drives the label transport 140.

Pulley 32 is secured to shaft 14. Shaft 30 has the pulley 34 secured to it. Belt 35 stretches between pulleys 32 and 34 and transmits the rotation of shaft 14 to shaft 30. Since pulleys 32 and 34 have the same diameter, shafts 14 and 30 rotate at the same rate. Cams 16 and 16' are oriented so as to bring about identical corresponding reciprocation of their respective plungers 20 and 20'.

To bring about movement of sheet 36 of labels in the direction of arrow 37, the shaft 38 must rotate counterclockwise and the shaft 39 must rotate clockwise. The label sheet is trapped between moving means, described below, that are secured to these shafts and is drawn toward guillotine knife 104 by them. The complete operation of the shafts is considered below.

Referring to FIGS. 5 and 7, lever 42 is secured to plunger 20 at a pivot connection with shaft 40. Passing through lever 42 is a pivot lever fulcrum pin 43, which pivot fulcrum pin is fixedly secured in the frame portion 82 of the apparatus (see FIG. 7). A pivot pin 44 pivotally secures the link 45 to the lever 42.

Eccentric cam 16 causes plunger 20 to reciprocate over a fixed distance during each cycle and thereby causes link 45 to reciprocate vertically through a fixed distance during each cycle. As will become apparent below, for various applications, it is necessary to have sheet 36 travel at differing rates and to have knife 104 descend with differing frequencies. The constant distance reciprocation of link 45 must be changed to controllable variable rotation of the gear 46, with which gear link 45 is connected, as is now described.

Next to gear 46 is located a coaxial wheel 47, which is freely rotatably mounted on shaft 38 and which cooperates in controlling link 45 movement. Gear 46 has an arcuate slot 48 passing through it which is alignable with an arcuate slot 49 passing through wheel 47. Part of slot 49 is shown hidden behind gear 46 in FIG. 5.

A pin 50, secured to both of the upwardly extending arms of link 45 (FIGS. 1 and 3), passes through slots 48 and 49. Pin 50 cooperates with composite slot 48, 49 to provide a lost motion connection between link 45 and gear 46. As will be discussed further below, both sheet 36 and knife 104 are moved only by the counterclockwise rotation of gear 46, which is caused by only the upward reciprocation of link 45. Downward reciprocation of link 45 only causes pin 50 to contact the lower or right hand end of slot 48, 49. This ensures that when pin 50 moves upward, it will have "lost motion" through the entire length of slot 48, 49.

Varying the total length of composite slot 48, 49 will vary the distance gear 46 rotates in the operative direction during each cycle, which, in turn, varies the speed of sheet 36 and the frequency of knife 104. To vary the length of slot 48, 49, the relative rotative positions of gear 46 and wheel 47 must be adjusted. Fixed, predetermined adjustment positions, corresponding, as will be discussed below, to the number of address columns on sheet 36, are preferable. Wheel 47 has a single, pin receiving opening 51 therethrough. Gear 46 has five such openings, 52a-e,

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therethrough, each of which may be aligned with opening 51 and each of which corresponds to a sheet 36 with a particular number of columns. Opening 51 is aligned with a selected opening 52. A removable pin 53 is passed through the chosen opening 52 and through opening 51, and is secured into position so it will not fall out during normal operations. If opening 52a is chosen, slot 48, 49 is at its full length, lost motion is greatest and sheet 36 travel rate is at its minimum. If opening 52e is closed, slot 48, 49 is at its shortest length, lost motion is least and sheet 36 travel rate is at its maximum.

A separate securing means 54 may also be provided to securely lock gear 46 and wheel 47 together.

While a lost motion connection has been specifically described, any means which converts the constant distance reciprocation of plunger 20 into controllable, adjustable rotation of gear 46 may be used. For example, the position of fixed pivot 43 for lever 42 may be made adjustable, with respect to the length of lever 42, so that the relative lengths of the lever arms between pivot 40 and pin 43 and between pivot 44 and pin 43 will be chosen such that link 45 will reciprocate upward in the direction driving gear 46 only the distance that it is desired that gear 46 move counterclockwise during each reciprocation cycle, thereby controlling the rate of sheet 36 movement and the frequency of knife 104 operation.

In FIGS. 1, 2, 3 and 5, when plunger 20 reciprocates downward, lever 42 pivots counterclockwise, link 45 moves up and gear 46 pivots counterclockwise around its own pivot support, viz shaft 38. When plunger 20 reciprocates upward, lever 42 pivots clockwise, link 45 moves down and gear 46 pivots clockwise. Gear 46 has a free rotation bearing 58, e.g. a ball bearing, within it by which it is mounted on shaft 38.

Turning to FIGS. 1, 2 and 5, freely rotatable gear 46 meshes with gear 62, which is freely rotatably mounted on shaft 39. To cause shaft 39 only to rotate in the clockwise direction, a conventional one-way clutch 66 is connected with gear 62 and shaft 39 so that when gear 62 is moving clockwise, clutch 66 causes a positive drive connection between gear 62 and shaft 39, whereby the shaft 39 is rotated clockwise. Clockwise rotation of gear 62 is caused by counterclockwise rotation of gear 46 which occurs when link 45 is reciprocating upward. During counterclockwise movement of gear 62, one-way clutch 66 releases the engagement between gear 62 and shaft 39, so that gear 62 freely rotates with respect to shaft 39, thereby precluding counterclockwise rotation of shaft 39.

Drive gear 70 is fixedly secured to shaft 39 and is rotated clockwise by such rotation of said shaft. Gear 70 meshes with gear 72, which is fixedly secured to shaft 38, so that clockwise rotation of gear 70 causes counterclockwise rotation of gear 72 and, hence, of shaft 38. In this manner, shafts 38 and 39 are properly driven to move label sheet 36 through the apparatus.

Anti-backlash gear 74, mounted on its own support shaft 76, is provided with its own one-way clutch 78, which ensures that gear 74 may rotate only counterclockwise. Gear 74 meshes with gear 70 and thus ensures that gear 70 and shaft 39 may rotate only clockwise and that gear 72 and shaft 38 may rotate only counterclockwise.

LABEL SHEET MOVING MEANS AND COLUMN CUTTING KNIFE MEANS

Turning now to FIG. 1, an elongated sheet 36 of labels to be applied is fed out of a standard sheet supply, e.g. a roll, or a bin and moves between the elements 82 and 84 of the frame of the label cutting and application mechanism. Sheet 36 conventionally is provided with a row of perforations 86 along both edges thereof, which help to guide the movement of the sheet.

Referring to FIGS. 1 and 2, a pair of wheels 88, having studs 89 on their peripheries, is provided. Wheels 88 are positioned along shaft 39 so that the studs on each wheel

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cooperate with one of the rows of perforations. Then wheels 88 are fixedly secured to shaft 39. As shaft 39 rotates clockwise, wheels 88 similarly rotate and pull sheet 36 along.

Additional means also move sheet 36. They include roller 90 secured to shaft 39 and cooperating roller 92 secured to shaft 38. The spacing between these rollers is such that sheet 36 is trapped between them, is drawn past the rotary circular column cutting knife elements, to be described shortly, and is moved toward the row cutting knife 104, to be described.

A circular wiper blade 94 with a sharpened edge 96 is fixedly secured to roller 92 to cooperate as part of the column cutter. A cooperating circular blade 98 is held on roller 90 and is biased away therefrom by a compression spring 100. The respective diameters of the blades 94 and 98 are such that they overlap, and the spring 100 presses the side surface of blade 98 against the side surface of blade 94. As sheet 36 passes over roller 90 and then moves between the rollers 90 and 92, it is caught between, and then cut into separate columns 103 by cooperating blades 94 and 98.

Only a single set of cooperating rollers 90 and 92 and cooperating knife blades 94 and 98 is shown. A single set of rollers and knife blades will produce two columns 103; two sets will produce three columns; three sets, four columns, etc. Additional sets of rollers and knife blades 102 are schematically suggested in FIG. 2, it being understood that these sets are identical in structure and function to the one described.

The positions of the sets of rollers, like 90, 92, and hence of the sets of blades, like 94, 98, along the shafts 38, 39 are readily adjustable in the field to take account of variations in the numbers of columns and in the widths of labels on individual sheets of labels.

ROW CUTTING KNIFE MEANS

Once sheet 36 has been cut into columns 103, the sheet is moved toward row cutting guillotine knife 104, which descends to cut the columns 103 of labels across a horizontal row to form individual labels 105.

Because both row cutting knife 104 and column cutting knife blades 94, 96, 98 are remote from the feed out, to be further described, to label applicator wheel 250, also to be further described, undesirable clutter in the vicinity of the wheel 250 is precluded.

Knife 104 reciprocates up and down within guide slots 106 of frame elements 107. The elements 107 are at opposite ends of the frame formed of elements 82, 84. Turning to FIGS. 1, 2 and 3, knife 104 is operated by knife operating lever 108 located on one end of the frame formed of elements 82, 84 and by an identical operating lever 108' on the other end of the frame. Connection means 109 and 109' respectively connect levers 108 and 108' to knife 104. Knife operating lever 108' is illustrated in FIG. 6. The lever pivots around its frame mounted fixed pivot 110'. When the lever pivots counterclockwise, knife 104 descends. When it pivots clockwise, the knife ascends. Lever 108' is provided with receiving slots 112' and 113' through which pass shafts 38 and 39, respectively, which slots are sufficiently vertically elongated so that the shafts will not interfere with the pivoting of lever 108'.

Lever 108' has a stud 114' fixedly secured to it. The stud is an engaging means because it is engaged by shelf 118', as described below. When stud 114' is forced upward, by means to be described, lever 108' pivots counterclockwise.

A lever 108' operator 116' is provided. There is an identical, but mirror imaged, operator 116 which simultaneously and correspondingly operates on lever 108. Lever operator 116 has a horizontal abutment shelf 118'. Because operator 116' has shelf 118', it is also the abutment arm. Operator 116' is pivotally secured at pivot mount 120' to the plunger 20' which is operated by cam

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16'. When plunger 20' reciprocates upward, and abutment shelf 118' is under stud 114', lever 108' is pivoted counterclockwise and knife 104 descends to cut off a row of labels.

Operator 116' also is provided with a fixedly mounted stud 124' which cooperates with the cam 126' to cause knife 104 to operate. Operator 116' thereby becomes a cam follower. Cam 126', being directly secured to shaft 39, rotates counterclockwise, as viewed in FIG. 6. Cam 126' serves to coordinate the movements of sheet 36 and of knife 104. Cam 126' includes a plurality of deep notches 128', and downstream of each of these deep notches is an outwardly curving cam portion 129'. A biasing means 130' urges operator 116' clockwise, as viewed in FIG. 6, so that the cam follower stud 124' presses against the periphery of cam 126'. Only when cam 126' has moved so that stud 124' is fully within one of notches 128', is the operator 116' sufficiently far to the right that the abutment shelf 118' moves beneath stud 114' on lever 108' during a downward reciprocation of plunger 20', and is thereafter urged up against the stud 114 on an upward reciprocation of plunger 20' to bring about cutting operation of knife 104. Whenever a portion of the periphery of cam 126', other than one of notches 128', is abutting stud 124', operator 116' will be urged sufficiently to the left, as viewed in FIG. 6, so that the operator 116' will reciprocate up and down under the influence of plunger 20' without its abutment shelf 118' contacting stud 114', whereby there will be no cutting by knife 104.

On the same shaft 39 is a second cam 132' (visible in FIG. 2 and shown hidden in FIG. 6), which acts to drive knife operating lever 108' clockwise to raise knife 104 as soon as stud 124' of operator 116' has moved out of a cam notch 128'. Cam 132' has outwardly projecting points 134'. A cam follower roller 136' is secured to the knife operating lever 108' and follows the periphery of cam 132'. As soon as stud 124' moves out of one of the notches 128' of cam 126', one of the points 134' of cam 132' rolls past cam follower 136' and forces it down, as viewed in FIG. 6, which pivots lever 108' clockwise, thereby raising knife 104.

From the foregoing, it is apparent that the corresponding reciprocation of plungers 20 and 20', through lever 42 and link 45 and the gear arrangement 46, 62, 70, 72, 74 operates both the label sheet moving and advancing mechanism and the knife operating mechanism. Cooperation between these two mechanisms is essential, since the knife 104 should not descend to make a cut a horizontal row until a complete row has passed beneath the knife and is in position to be cut. Dependent upon which of openings 52 in gear 46 is aligned with opening 51 in wheel 47, for each stroke of lever 42, the shafts 38, 39 and, hence, the sheet 36 and the cams 126, 126' and 132, 132' advance a predetermined distance. Thus, with both the sheet moving means and the row cutting knife operating off the same shafts 38 and 39, the necessary cooperation and required coordination in speed variations is obtained.

LABEL APPLICATION

Referring to the label applicator device shown in FIGS. 1, 2 and 4, a conventional label applying applicator wheel 250 operates off the main drive shaft 11 through the gear 256 on the drive shaft, which gear meshes with gear 258 on shaft 260 of wheel 250. Thus, one rotation of shaft 11 is equivalent to one cycle of rotation of wheel 250. Belt 142, to be described below, moves labels 105 toward applicator wheel 250. The labels pass under feed out roller 252 and are fed onto the surface of applicator wheel 250. The wheel has a perforated portion 254 which connects, through an interior chamber in the wheel which leads through the opening 256, to a conventional vacuum source. At the beginning of a cycle, wheel 250 is in a position where a label forced between belt 142 and roller 252 passes onto the periphery of wheel 250 over

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perforated portion 254. The vacuum holds the label in place. During the cycle, the wheel 250 rolls around until the perforated portion 254 is aimed downward and the wheel is over an item to be labeled. During the rolling, adhesive may be applied to the label. Then the vacuum is released, and the label is rolled off on the item to be labelled. A cycle ends when the perforated portion is again in position to receive another label.

If there are two columns of labels, when a row of labels is cut off, there will be two labels to be applied. Thus, the applicator wheel 250 must go through two complete cycles before all of the labels cut off in one knife cut will be used up. In this situation, a cutting operation by knife 104 should be delayed until two complete cycles of the applicator wheel 250 have taken place.

Turning to FIG. 6, since two complete cycles of wheel 250 must be completed before knife 104 should descend, at the end of the first cycle, the length of lost motion connection slot 48, 49 would have been adjusted so that shaft 39 would have caused cam 126' to have rotated to the position shown in FIG. 6, with stud 124' having moved only part way along one of the outwardly curving portions 129' of cam 126'. It would, therefore, take two complete cycles for stud 124' to move between neighboring notches 128' and would require two cycles be completed before knife 104 descends.

Furthermore, since it takes two complete cycles before knife 104 may descend, it should also take two complete cycles before the next row of labels on sheet 36 is in position to be cut, whereby the speed of movement of the sheet 36 would be slowed, e.g. halved, accordingly. Appropriate adjusting, described above, of the length of the lost motion connection slot 48, 49 also adjusts the speed of sheet 36. Thus, by merely adjusting the lost motion connection slot, the operation of knife 104 and the movement of sheet 36 are properly coordinated with the movement of applicator wheel 250, no matter how many columns of labels there are on sheet 36.

LABEL TRANSPORT

After individual labels 105 have been cut, they settle onto the label transport 140, which is comprised of a belt 142 that passes around the pulleys 144 and 146. Guide panels (not shown) may be fixedly positioned next to the upper surface of belt 142 so that the labels settle properly in place on the belt. The belt is moved counterclockwise in FIGS. 1 and 3 by means to be described below, so that its upper surface moves labels toward the applicator wheel 250.

Belt 142 is, preferably, a vacuum belt which holds the cut labels to itself and prevents them from blowing away as belt 142 moves. Referring to FIGS. 2 and 3, an enclosed vacuum chamber 300 is disposed and fixedly supported (by support means not shown) beneath the upper surface of belt 142 so that the upper surface of the belt runs over the chamber. A conventional vacuum source (not shown) continuously sucks air from chamber 300 through conduit 302.

There is a continuous, narrow slot opening 304 into chamber 300 which is normally blocked by the adjacent surface of belt 142. However, as belt 142 moves, the holes 306, 308, 310 therethrough (only some of which are shown) communicate with opening 304 in chamber 300 and there is a continuous suction through the holes in the belt. Each set of holes, 306, 308, 310, is arrayed to be beneath a respective label after it has been cut off by knife 104 and has settled onto belt 142, whereby the suction through these holes will hold the labels in place as they travel along.

During each cycle of wheel 250, a new label must be moved by belt 142 into position to be picked up by wheel 250. As has been mentioned above, a sheet of labels may include any number of columns of labels, although label sheets normally fall within the range of from one to six columns in width. The widths of columns may vary,

and usually, when there are fewer columns, each column is of a greater width. When columns are of a greater width, the belt 142 must travel a greater distance to bring each label into a position where it can be picked up by the applicator wheel. When the columns are narrower, the distance that must be travelled by belt 142 to position the next label near the applicator wheel is shorter.

Referring to FIG. 4, pulley 144 is the drive pulley for belt 142, and pulley 144 is fixedly secured to shaft 148. Also fixedly secured to shaft 148 is gear 150, which meshes with the two part sector gear 152, 154 to be described further below. One of the sections of gears 152, 154 is fixedly secured to shaft 30, which shaft is rotated, through pulley 34 by belt 35. Belt 35 is moved by the basic drive shaft 11 through gears 12, 13, shaft 14 and pulley 32. Coordination between the operation of the label applicator and of the label transport is obtained because both work off the common drive shaft 11. To account for the variations in the distances that must be travelled by belt 142 to position the next label 105 where it might be picked up by the applicator wheel 250, which variations occur because of variations in the widths of columns and in their numbers, sector gear 152, 154 is made up of two gear sections 152 and 154, each including a gear sector on its periphery, which sector has an angular length of less than a full 360°, e.g. 120°. The gear sectors are relatively adjustable with respect to each other, so as to create a single adjustable sector gear having gear teeth around its periphery extending from a minimum angular length, which is the angular length of the toothed portion on the section 152 or 154 that extends the maximum angular length around one of those gear sectors, to a maximum angular length for the combined gear, where in the two sections 152 and 154 are positioned with respect to each other so that the teeth of one section, 152, begin only after the teeth of the other section, 154, stop. Since it is the positive engagement between the combined teeth of sections 152, 154 with the teeth of gear 150 that produces movement of belt 142, increasing or decreasing the length of the toothed portion of combined sector gear 152, 154 respectively increases and decreases the distance travelled by belt 142 in one cycle.

A stud 158 extending out of section 154 passes through a slot 160 in section 152, and when the two sections 152 and 154 have been properly positioned for a particular label sheet, the stud, or a means attached to it, serves as a securing means for securing the two gear sections together to form a single gear. Thus, proper movement of labels 105 by belt 142 can be obtained by a simple adjustment of gear sections in the field, regardless of the number of columns of labels or of the widths of individual columns.

ITEMS TO BE LABELLED

A conventional transport 264 moves the items, e.g. magazines 266, to be labelled beneath wheel 250. The operation of this conventional item transport is such that the item 266 passes beneath wheel 250 when the label on the wheel has been rotated into a position to be applied to the surface of the item. Such coordination could readily be obtained by driving the item transport off main drive shaft 11.

LABEL IMPRINTING

On some occasions, it may be desirable to imprint the labels 105 with additional legends, in addition to those originally appearing on them. An optional imprinting device 270, shown in FIG. 4, is provided for this purpose. It includes imprinting wheel 272 which is supported by its mounting shaft 274. Additional brackets, not shown, but known in the art, may be provided to support imprinting wheel 272 with respect to the rest of the apparatus in the appropriate position. Imprinting wheel 272 should move through a cycle corresponding to the cycle

of the label application wheel 250, because during a single cycle of rotation of imprinting wheel 272 a single label 105 should be imprinted with a legend.

Accordingly, shaft 274 is connected, by a belt drive 276, with shaft 30. As noted above, shaft 30 is connected, through pulley 34, belt 35, pulley 32, shaft 14 and gears 13 and 12, with shaft 11, which shaft also directly drives application wheel 250. Accordingly, for each cycle of rotation of shaft 11, there will be a single cycle of rotation of application wheel 250 and a single cycle of rotation of imprinting wheel 272.

The material 278 to be imprinted is placed on the peripheral surface of wheel 272, e.g., in the form of raised type. Material 278 may be supported in position on wheel 272 in any of the conventionally available ways, including the periphery of the wheel having a T-shaped groove (not shown) which receives the T-shaped base (not shown) of the print type face. The orientation of application wheel 250 and of imprinting wheel 272 with respect to each other is adjusted so that the print 278 on the periphery of wheel 272 comes around to contact each label 105 when the label is passing under this wheel.

Referring to FIG. 1, as wheel 272 rolls around, the raised type rolls over the label 105 already affixed to the item 266' to be labelled and imprints the additional material on the label 105.

An inking roller 280 is supported by its own shaft 282, and by additional conventional brackets, if desired, and is so positioned with respect to the periphery of imprinting wheel 272 as to ink the print 278 on the periphery of wheel 272 in order to enable a legend to be imprinted. Alternative conventional imprinting means may be provided for imprinting labels 105.

There has just been described a novel means for cutting and applying labels to items to be labelled. The device shown herein relies upon a simple adjustable lever and cam arrangement which takes account of the variations in the widths of sheets of labels to be cut, the widths of the columns of the labels and the number of columns. In addition, the labels are cut at a location remote from the means which applies the label to an item to be labelled, rather than cluttering the vicinity of the applicator means.

Although this invention has been described with respect to its preferred embodiments, it should be understood that many variations and modifications will now be obvious to those skilled in the art, and it is preferred, therefore, that the scope of the invention be limited not by the specific disclosure herein, but only by the appended claims.

I claim:

1. A label cutting and application apparatus, which includes

sheet moving means for moving a sheet of labels lengthwise to a label cutting mechanism;

a label cutting mechanism comprising a first knife means for cutting a sheet lengthwise to separate the sheet into columns of labels, and a second knife means for cutting across a sheet to cut off a row of labels, whereby after both of said first and second knife means have operated, at least one individual label is formed;

a label transport positioned so as to receive a row of labels that have been cut from the sheet by said second knife means, and for transporting and delivering the cut labels to an applicator;

an applicator, positioned to receive labels from said transport, for applying each label, in turn, to an item to be labelled;

a drive means for operating said applicator repetitiously through a cycle comprising, starting at a label receiving position and receiving a label from said transport, applying the label to an item to be labelled, and returning to the label receiving position;

first adjustable coordinating means for coordinating the operation of said sheet moving means and of said second knife means so that said second knife means operates to cut off a row of labels from a sheet only after said sheet moving means has moved the sheet sufficiently so that said second knife means, when operated, will cut off a row of labels; said first coordinating means being adjustable to compensate for variations in the number of columns of labels;

said drive means also being operatively connected to said first coordinating means and, through said first coordinating means, to said sheet moving means and to said second knife means;

said first coordinating means being adjustable so that said applicator goes through as many complete cycles as there are columns of labels on a sheet before the sheet is able to move lengthwise to where a new row is in position to be cut off, and before said second knife is caused to cut off the next row of labels;

said first coordinating means comprising,

a lever which, on the one hand, is connected to said drive means to be driven thereby, and which, on the other hand, is connected to said sheet moving means and to said second knife means to drive these; adjustment means connected with said drive means, with said lever and with said sheet moving means and said second knife means so as to selectively adjust both the distance said sheet moving means causes a label sheet to travel during each applicator cycle and the frequency of operation of said second knife means with respect to the number of cycles of operation of said applicator to adjust for variations in the number of columns of labels on the sheet;

second adjustable coordinating means for coordinating the operation of said transport with the cycle of said applicator so that a label is received by said applicator at the proper time during its cycle; said second coordinating means being adjustable to compensate for variations in the number of columns of labels.

2. The label cutting and application apparatus of claim 1, wherein

said second coordinating means comprises a connection means which connects said drive means with said transport device;

said connection means being adjustable to vary the distance travelled by said transport during each cycle of said applicator, thereby to adjust for the number of columns of labels and the width of each column of labels.

3. The label cutting and application apparatus of claim 2, wherein said connection means is adapted to connect said drive means to said transport for an adjustable predetermined period of time during each cycle of said applicator.

4. The label cutting and application apparatus of claim 3, wherein said connection means comprises a sector gear with an operative surface having an adjustable angular length.

5. The label cutting and application apparatus of claim 1, wherein said adjustment means comprises a lost motion connection located between said drive means, on the one hand, and said sheet moving means and said second knife means, on the other hand, with the extent of lost motion being adjustable.

6. The label cutting and application apparatus of claim 5, wherein said second knife means and said sheet moving means are connected with and operated off a single gear which is connected with said lever through said lost motion connection.

7. The label cutting and application apparatus of claim 1, further including a suction device positioned so that

said label transport carries the labels past said suction device on the way to said applicator; and said suction device being so associated with said transport as to suck the labels into secure engagement with said transport and to hold them there until delivered to said applicator.

8. The label cutting and application apparatus of claim 1, wherein said sheet moving means comprises shaft means connected by said first connection means with, and rotated by, said lever in a direction which moves the sheet toward said second knife means; said shaft means including gripping means for gripping the sheet to facilitate its being moved.

9. The label cutting and application apparatus of claim 8, wherein said shaft means comprises two neighboring, parallel shafts, each holding gripping rollers of which said gripping means is comprised, which rollers are for moving said sheet; said shafts being connected to each other so as to rotate in opposite directions, which directions are chosen so that the sheet is moved toward said second knife means.

10. The label cutting and application apparatus of claim 9, wherein one-way clutch means is connected with said shafts to cause them to rotate only in the desired direction;

said lever is connected to said sheet moving means through said adjustment means being connected to and operating upon said clutch means.

11. The label cutting and application apparatus of claim 9, wherein said first knife means is connected with said shafts, whereby movement of the sheet past said shafts also causes lengthwise cutting of the sheet into columns.

12. The label cutting and application apparatus of claim 11, wherein said first knife means is positioned to operate upon and cut the sheet into columns before said second knife means cuts the sheet into rows;

said applicator is remote from said second knife means, thereby avoiding clutter in the vicinity of said applicator.

13. The label cutting and application apparatus of claim 12, wherein said adjustment means comprises a lost motion connection located between said drive means, on the one hand, and said sheet moving means and said second knife means, on the other hand, with the extent of lost motion being adjustable.

14. The label cutting and application apparatus of claim 9, wherein there is a cam connected with one of said shafts and operable thereby;

said second knife means includes a cam follower device, which is in engagement with said cam, to actuate said second knife means to cut a row of labels;

said cam is designed so that it is moved to a position where it causes said cam follower device to move to where said second knife means is actuated to cut a row of labels only when said shafts have moved a sheet sufficiently so that a row of labels is in position to be cut off.

15. The label cutting and application apparatus of claim 14, wherein said adjustment means comprises a lost motion connection located between said drive means, on the one hand, and said sheet moving means and said second knife means, on the other hand, with the extent of lost motion being adjustable.

16. The label cutting and application apparatus of claim 15, wherein said second coordinating means comprises a connection means which connects said drive means with said transport;

said connection means being adjustable to vary the distance travelled by said transport during each cycle of said applicator, thereby to adjust for the number of columns of labels and the width of each column.

17. The label cutting and application apparatus of claim 16, wherein said connection means comprises a sector gear with an operative surface having an adjustable angular length;

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said sector gear being positioned and adapted to connect said drive means to said transport, and being adjustable so as to vary the length of the period of time of the aforementioned connection.

18. The label cutting and application apparatus of claim 14, wherein said drive means comprises a motor which is connected with a drive shaft that is rotated by said motor; said drive shaft having an eccentric cam thereto connected which is rotated thereby; a cam follower plunger held in engagement with said eccentric cam and movable thereby;

said lever being connected to said drive means by being connected to cam follower plunger, whereby movement of said cam follower plunger operates said sheet moving means and said second knife means.

19. The label cutting and application apparatus of claim 18, wherein said label applicator is connected with said drive shaft, whereby cyclic operation of said applicator is directly related to operation of said cam follower plunger.

20. The label cutting and application apparatus of claim 14, wherein said cam follower device includes an abutment arm which is connected to said drive means by a reciprocation device which causes said abutment arm to reciprocate as said drive means operates; an engaging means directly connected with said second knife means, such that when said abutment arm reciprocates into abutment with said engaging means, said second knife means cuts off a row of labels;

means for holding said abutment arm in abutment with said cam; said cam being so shaped that it alternately forces said abutment arm away from where it can

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reciprocate into engagement with said engaging means and then permits said abutment arm to move to where it can reciprocate into engagement with said engaging means; said cam being so shaped and oriented and so connected with one of said shafts that said abutment arm is permitted by said cam to reciprocate into engagement with said engaging means only after a row of labels has been moved by said sheet moving means to where it can be cut off by said second knife means.

21. The label cutting and application apparatus of claim 20, wherein said drive means comprises a motor which is connected with a drive shaft that is rotated by said motor; said drive shaft having a second eccentric cam thereto connected which is rotated thereby;

a second cam follower plunger held in engagement with said second eccentric cam and reciprocatingly movable thereby;

said abutment arm being connected to and movable by said second cam follower plunger.

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