April 2, 1957 O. W. CHRISTENSSON 2,787,396

CARTON TAPING MACHINE

Filed May 27, 1955 6 Sheets-Sheet 1

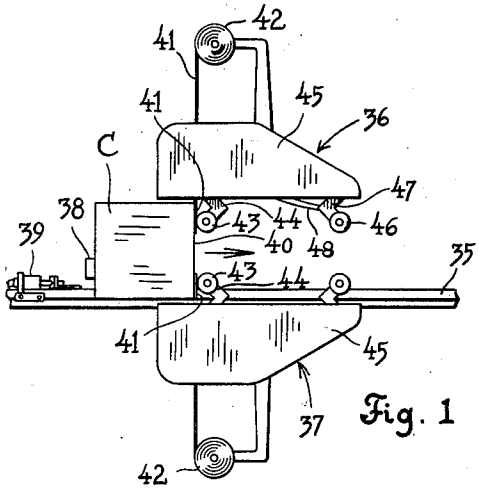


Fig. 1

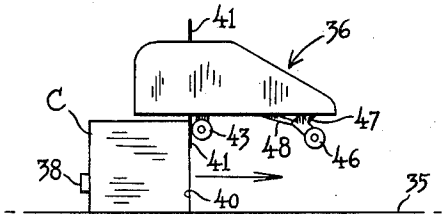


Fig. 2

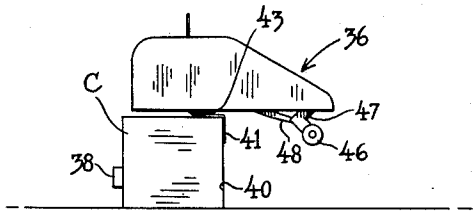


Fig. 3

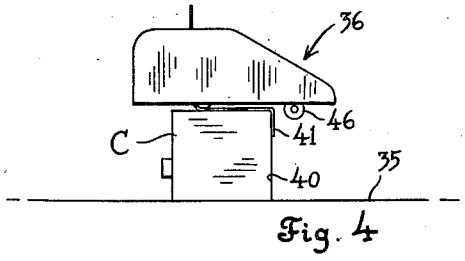


Fig. 4

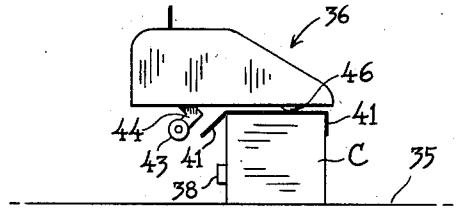


Fig. 5

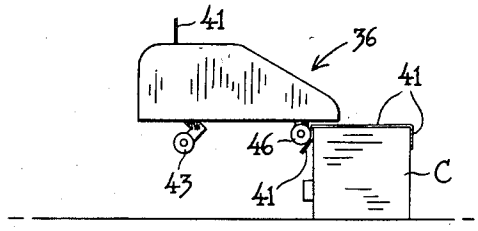


Fig. 6

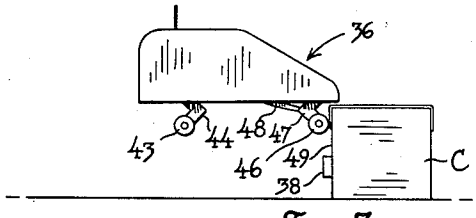


Fig. 7

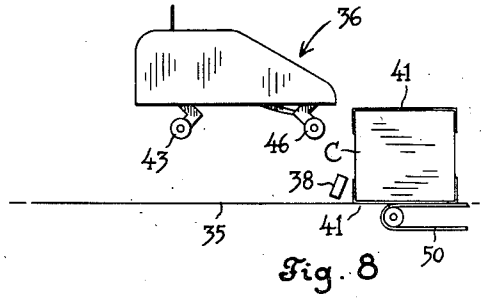


Fig. 8

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CARTON TAPING MACHINE

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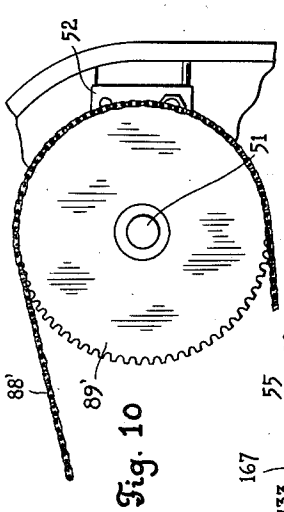


Fig. 10

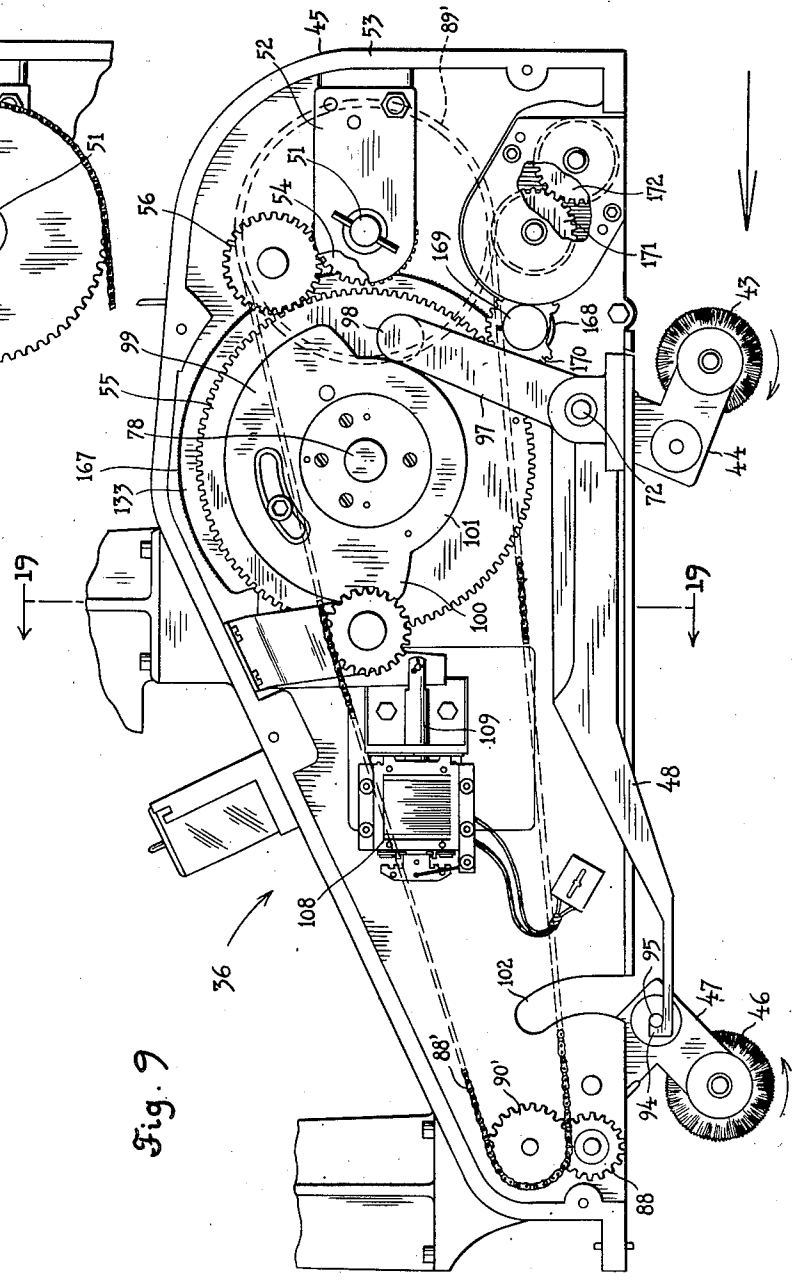


Fig. 9

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CARTON TAPING MACHINE

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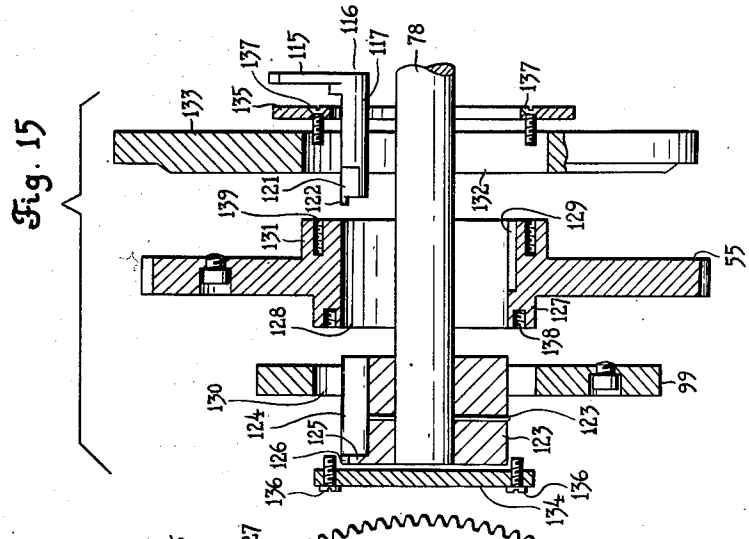


Fig. 15

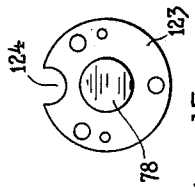


Fig. 13

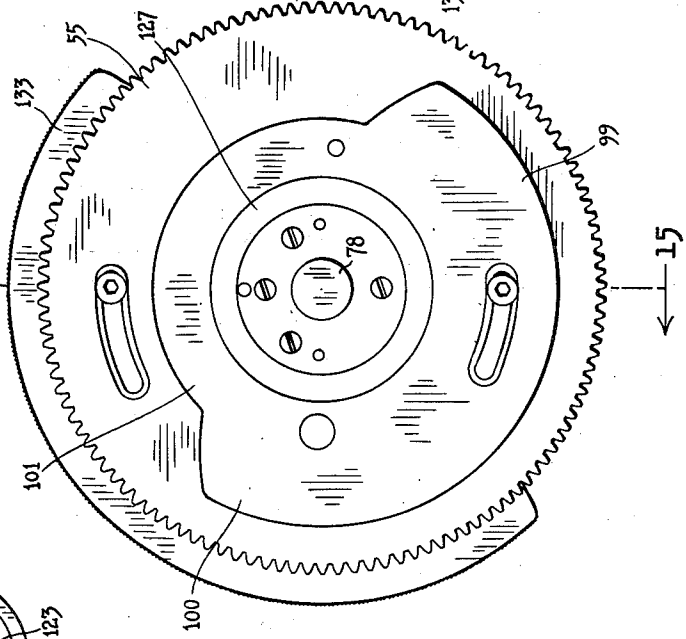


Fig. 14

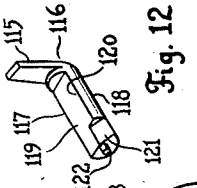


Fig. 12

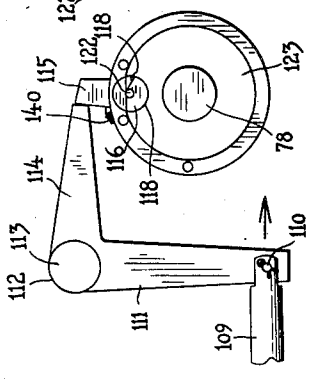


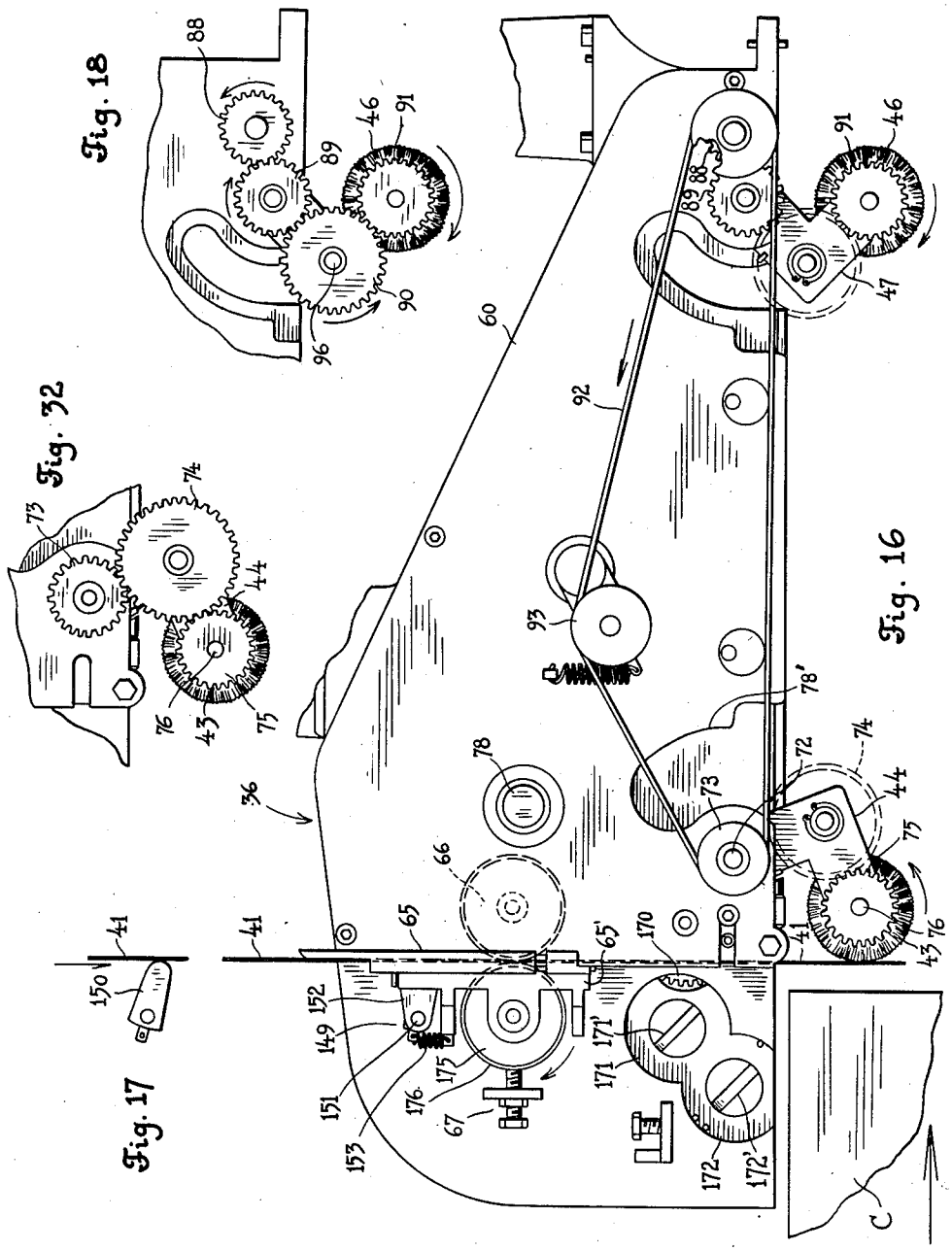
Fig. 11

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CARTON TAPING MACHINE

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CARTON TAPING MACHINE

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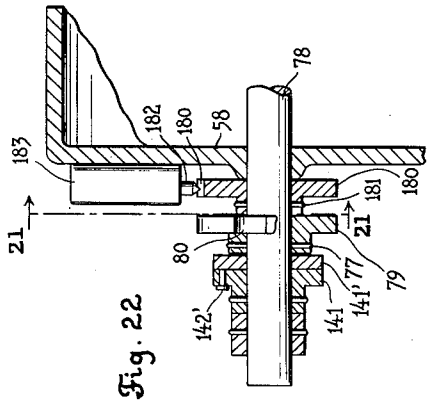


Fig. 22

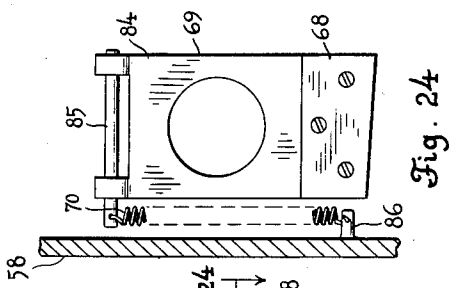


Fig. 24

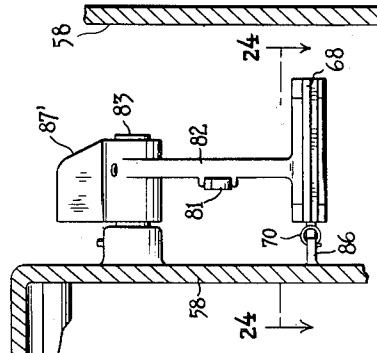


Fig. 23

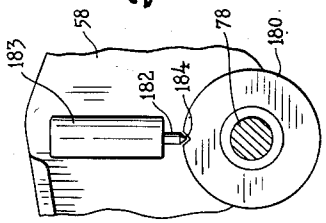


Fig. 21

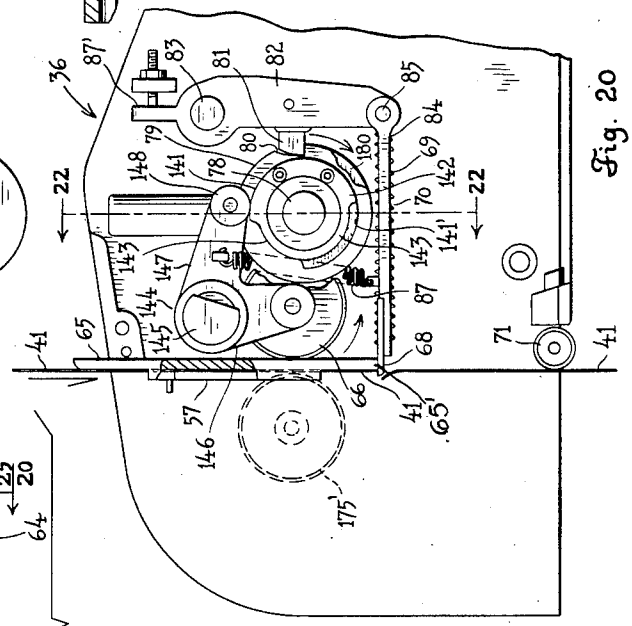


Fig. 20

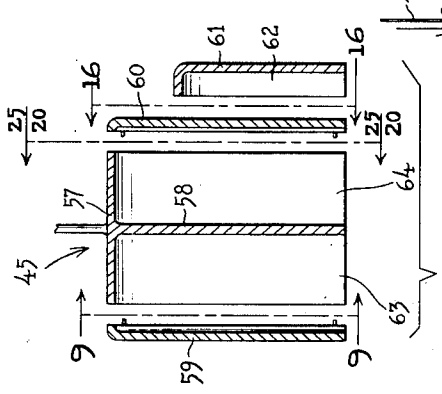


Fig. 19

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CARTON TAPING MACHINE

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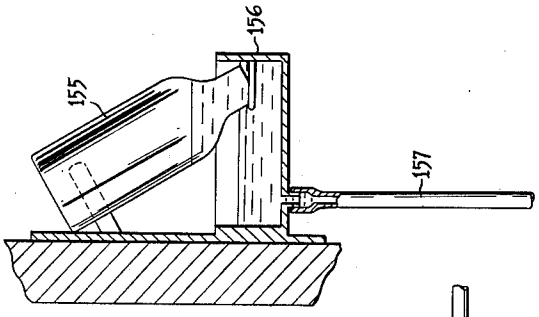


Fig. 30

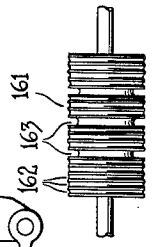


Fig. 29

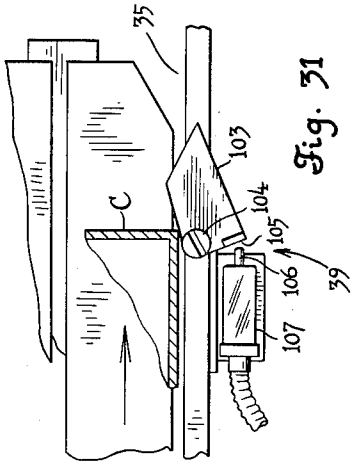


Fig. 31

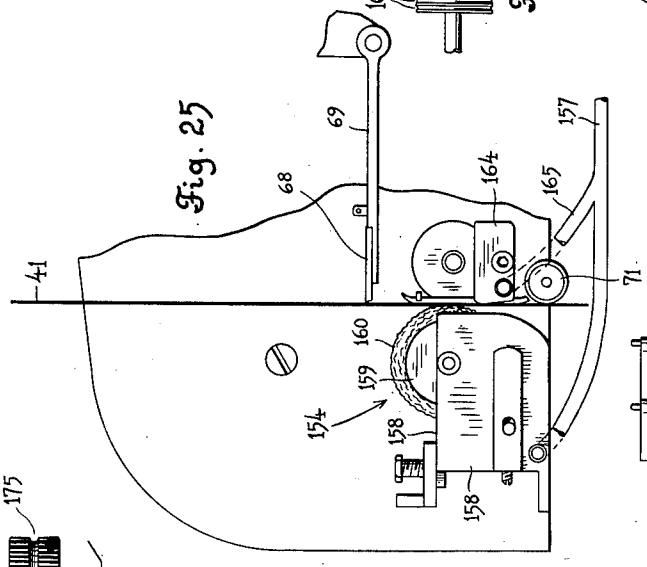


Fig. 25

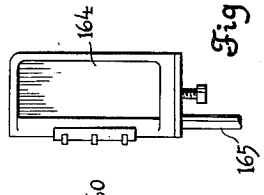


Fig. 28

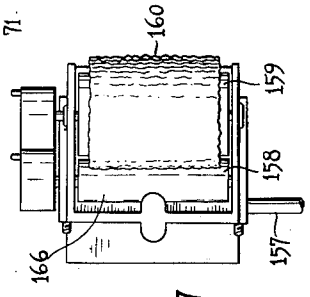


Fig. 27

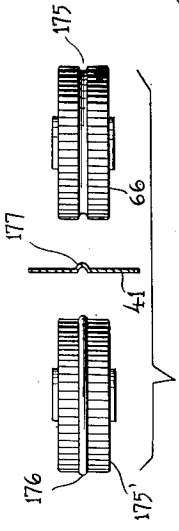


Fig. 33

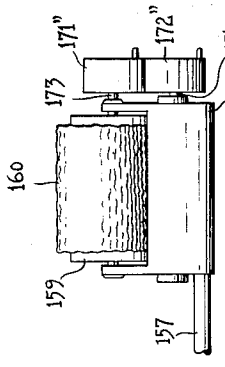


Fig. 26

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United States Patent Office 2,787,396 Patented Apr. 2, 1957

2,787,396

CARTON TAPING MACHINE

Od W. Christensson, Stockholm, Sweden

Application May 27, 1955, Serial No. 511,714

14 Claims. (Cl. 216—25)

This invention relates to mechanical automatic container-sealing mechanisms and more particularly to machines which seal containers, such as cartons, cases, boxes and packages, by applying adhesive tapes to seal the flaps or covers and to adhere said sealed flaps or covers to the body of the carton.

In recent years the advantages of sealing cartons by the application of adhesive tape, have been recognized by the trade to the extent that numerous attempts have been made to furnish automatic equipment for applying such tape. Obviously the presently used manual method of application is economically unsatisfactory. Moreover, dependency upon the human element in manual application does not insure uniformly satisfactory sealing.

Heretofore, however, to my knowledge none of the previously introduced machines afforded a completely satisfactory method for continuously sealing cartons by the application of adhesive tape thereto. For example, in some machines the application was not continuous but merely intermittent; hence the cartons likewise could not be moved continuously but only intermittently. In other machines the length of tape could not be automatically varied in accordance with the length of the cartons to which it was to be applied. Thus only one size of carton could be fed to the machine at one time. Any change in length of the carton required stopping of the machine and manual adjustment thereof.

In other machines no provision was made for automatically preventing the feeding of a length of tape in the absence of a carton in the conveyor line. Thus it was difficult to properly maintain assembly line production. Oftentimes the feeding of a tape in the absence of a carton resulted in confusion and highly undesirable production stoppages.

In still other machines the cutting mechanisms were fully exposed and were capable of functioning only when the tape was stretched between two adjacent cartons, the cutting taking place between the cartons. Absence of a carton in the assembly line again resulted in production interruption indicating that the machine was incapable of affording the flexibility necessary in modern automation production. Moreover, the exposure of the sharp cutting blade was highly undesirable from a safety standpoint.

Prior machines were also characterized by their inability to uniformly and properly wet the tape adhesive to insure maximum adhesion. The tapes were often either insufficiently or excessively wetted, both of which resulted in unsatisfactory sealing of the cartons. Furthermore most of the prior machines were highly complex, expensive both in initial cost and in maintenance, and in many cases were excessively large and not conductive to compact, space-saving construction.

It is, therefore, an important object of this invention to provide a carton taping machine which will overcome all of the disadvantages mentioned hereinabove.

Another important object is to afford a taping machine comprising a pair of similar units, one of which may be used to apply tape to the top of a carton and the other of which may be used to apply tape to the bottom of a carton, either simultaneously, successively or selectively if desired.

A further object is to provide carton taping units which may be installed and used in connection with carton gluing mechanisms, both of which units and mechanisms may be powered by a single motor.

Still another object is to afford a carton taping machine having rotatable tape-brush-rollers mounted on arms which protrude from the taping unit into the path of the moving carton, said brushes being mounted on pivotally mounted arms permitting movement of the brushes in directions suitable to accommodate the movement of the cartons, while simultaneously insuring satisfactory application of the tape on the leading end walls of the cartons, across the top and bottom of the cartons, and on to the trailing back walls of the cartons.

Still a further object is to afford automatic actuating and control means for feeding the tape from rolls at speeds synchronized with the movement of the cartons so that the tape is also pre-positioned in readiness for application of each successive carton and in pre-determined cut lengths as measured by the length of the carton itself. Thus each tape is of exactly the proper length for application to the particular cartons to which it is to be applied, irrespective of the variation of lengths between successive cartons.

Yet another object is to afford an automatic moistening device in the machine for controlling the amount of moistening agent (water) contacting the adhesive surface of the tape.

Yet a further object is to afford actuating means for controlling the movement of at least one of the tape-applying brushes, the tape-feeding mechanism, the tape-cutting mechanisms, and the moistening mechanism, automatically in accordance with the passage of each carton in a continuous conveyor feeding system.

To achieve the results and functions mentioned hereinabove, the machine comprises one or more taping units having a pair of tape-applying brushes each rotatably mounted on the end of a spring-pressed arm which is in turn pivotally mounted for movement in an arcuate path upon the passage of the cartons therebelow or above as the case may be. Means for pivotally moving one of the brushes in and out of operational position to accommodate successive passage of cartons therebelow is also provided.

A pre-feed cam operated roller device is further provided to feed a predetermined length of tape in front of the moving cartons. Automatically operated tape-cutting mechanisms are afforded in the machine and a geared, magnetically-actuated clutch device is provided to control the cutting mechanisms as well as the feeding mechanism. The machine is also provided with an automatic moistening device with means for controlling the amount of water applied to the adhesive surface of the tape.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel features of construction, arrangement and a combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportion, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

For the purpose of facilitating an understanding of

my invention, I have illustrated in the accompanying drawings a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, my invention, its mode of construction, assembly and operation, and many of its advantages should be readily understood and appreciated.

Referring to the drawings in which the same characters of reference are employed to indicate corresponding or similar parts throughout the several figures of the drawings:

Fig. 1 is a schematic side elevational view of the tape-applying apparatus of a carton-sealing machine showing a carton in operational position at the beginning of the tape-applying process;

Figs. 2–8 inclusive are similar schematic drawings of the top unit of the tape-applying apparatus showing successive steps in the tape-applying process;

Fig. 9 is a side view of one of the taping units with a side cover of the housing removed, taken substantially on the plane of line **9—9** in Fig. 19 of the drawings and viewed in the direction indicated;

Fig. 10 is a fragmentary detail view illustrating a detail of construction of one of the parts shown in Fig. 9 of the drawings;

Fig. 11 is a fragmentary detail view showing the clutch actuating mechanism in elevation;

Fig. 12 is a perspective detail view of the clutch pin;

Fig. 13 is another end elevational view of a portion of the clutch mechanism;

Fig. 14 is an enlarged elevational view of some of the cam and gear assemblies;

Fig. 15 is an exploded sectional view taken on the plane of line **15—15** in Fig. 14 of the drawings and viewed in the direction indicated;

Fig. 16 is a side elevational view of the taping unit viewed from the side opposite to that of Fig. 9, taken on the plane of line **16—16** in Fig. 19 of the drawings, viewed in the direction indicated, with some walls broken away and with some of the gear elements illustrated in phantom outline for the purpose of facilitating the illustration and description of the figure;

Fig. 17 is a side elevational view of a detail of construction;

Fig. 18 is a fragmentary detail view of the gearing of the trailing tape-applying brush arm;

Fig. 19 is a sectional exploded view of the housing of one of the taping units taken on the plane of line **19—19** in Fig. 9 of the drawings and viewed in the direction indicated;

Fig. 20 is a fragmentary detail view of the tape-cutting mechanism and tape feeding control mechanism, as viewed from the plane of line **20—20** in Fig. 19 of the drawings;

Fig. 21 is a fragmentary detail view illustrating another detail of construction taken on the plane of line **21—21** in Fig. 22 of the drawings;

Fig. 22 is a fragmentary sectional view taken on the plane of line **22—22** in Fig. 20 of the drawings and viewed in the direction indicated;

Fig. 23 is a front elevational view of the cutting mechanism showing a fragmentary portion of the housing in section;

Fig. 24 is a top plan view of the cutting blade detail as taken on the plane of line **24—24** in Fig. 23 of the drawings and viewed in the direction indicated;

Fig. 25 is a fragmentary view in elevation of the tape-wetting mechanism, as viewed from the plane of the line **25—25** in Fig. 19 of the drawings;

Fig. 26 is a front view in elevation of one of the details of the wetting mechanism;

Fig. 27 is a top plan view of the wetting mechanism detail illustrated in Fig. 26 of the drawings;

Fig. 28 is a fragmentary top plan view of another detail of the wetting mechanism;

Fig. 29 is yet another fragmentary view of another detail of the wetting mechanism;

Fig. 30 is a fragmentary view partially in section and partially in elevation showing another detail of the wetting mechanism;

Fig. 31 is an enlarged fragmentary detail view of the microswitch mechanism of the taping unit;

Fig. 32 is a view similar to Fig. 18 but showing the gearing of the leading tape-applying brush arm; and

Fig. 33 is an exploded top plan view of the tape-feeding rolls illustrating the tape-stiffening device formed thereon.

Before proceeding with the detail description of the taping mechanism illustrated in the several figures of the drawings, it should be noted that the taping unit may comprise either a separate machine or may be incorporated in a carton gluing machine having means for gluing the flaps of a carton as well as applying tape to seal the same. In the latter-mentioned carton-gluing and taping machine, the two methods of carton closure may be either selectively or simultaneously practiced.

Referring now to the schematic drawings of the taping units, as illustrated in Figs. 1–8, attention is first directed to Fig. 1 in whcih a carton C is shown moving in the direction indicated by the arrow on a conveyor belt **35** between a pair of taping units designated generally by reference numerals **36** and **37**. One unit **36** is positioned in spaced relationship above the belt **35** and the other, **37**, is positioned below the same but aligned with the upper unit **36**. As so positioned, it will readily be appreciated that the upper unit applies a length of tape to the top of the carton while simultaneously the lower unit **37** applies a similar length of tape to the bottom of the carton. However if desired, the two units may be positioned in stagered relationship so that one or the other applies the tape first to the carton.

It should further be noted that since the two units are substantially identical, only the upper unit **36** is illustrated both in the remaining schematic drawings as well as in the other figures of the drawings but solely for the purpose of facilitating the illustration and description of the machine.

It will be noted that the carton C is being moved by means of a pusher bar **38** which is positioned in spaced relationship along the entire length of the endless conveyor belt **35**. It will further be noted in Fig. 1 of the drawings that the carton C has been pushed past a microswitch mechanism **39**, the structure and function of which will be disclosed as the description proceeds. It will further be noted that the carton C is positioned so that its front end **40** abuts the ends of a pair of lengths of tape **41**, the top one depending from the roll **42** of such tape and the bottom one projecting upwardly from a similar roll. It will further be noted that the two lengths of tape **41** are positioned so that they respectively depend and project along the front of the carton C only a relatively short distance from the bottom or top thereof respectively. It will further be noted that these lengths of tape **41** are being pressed against the front surface of the carton C by tape-applying roller brushes, such as **43**, which are mounted on the ends of bell crank arms **44** which in turn depend or project upwardly, as the case may be, from housings such as **45** of the taping units **36** and **37**.

As the pusher bar **38** pushes the carton C forward under the taping unit **36**, it will be noted in Fig. 2 of the drawings that the brush arm **44** is pushed back and upwardly in a counterclockwise direction so that the brush **43** moves up on the tape **41** simultaneously smoothing the same onto the surface of the carton. As the carton C progresses still further forward beneath the taping unit, the brush arm **44** continues to pivot forwardly and upwardly until the brush **43** has been raised to a position where the carton C may pass directly thereunder as shown in Fig. 3 of the drawings. Then as the carton progresses still further forwardly, the tape **41** is applied to the top and bottom of the carton, as shown in Fig. 4 of the drawings. At the same time it will be noted that

a rearwardly positioned roller brush **46** also mounted on a bell crank arm such as **47**, is being pivoted in a clockwise direction by hook member **48**, which will be described in greater detail as the description proceeds. Thus it will be noted in Fig. 4 of the drawings that the rear brush **46** continues to be raised until, as shown in Fig. 5 of the drawings, it is sufficiently raised to permit the carton C to pass under it as the rotating brush smoothes onto the top of the carton, the tape which had been applied thereto by the first brush **43**. It should further be noted that the raised position of the rear brush **46** is achieved before the leading edge of the carton C reaches the same.

In Fig. 5 of the drawings the carton is shown as having already passed under the front brush **43**, which has already been returned to its initial lowered position by spring action. It will further be noted that the tape **41** has been pre-cut so that the length of the same is sufficient to permit the rear segment thereof to overlap the rear top edge of the carton C. Thus in Fig. 6 of the drawings it will be perceived that the trailing edge of the carton having passed the rear brush **47**, the same is being lowered, thereby brushing the trailing segment of the tape **41** down on the rear end wall **49** of the carton C.

In Fig. 8 of the drawings it will be noted that the top and bottom lengths of tape such as **41** completely seal the flaps on the top and bottom of the carton and also extend downwardly and upwardly respectively along the front and rear end surfaces of the carton a distance sufficient to afford a strong seal entirely adequate to insure against inadvertent opening of the carton. The carton C is illustrated being transferred directly from the conveyor belt **35** to a loading rack **50**.

The description to this point has been concerned primarily with the tape-applying process and has described the functioning of certain parts of the taping unit in applying the tape **41** to the carton. It should, of course, be understood that the tape **41** may be any conventional type, such as adhesive-coated paper, fabric, plastic or the like. So also the carton C is merely representative of many types, sizes and designs of cases, packages, boxes and the like.

Referring now to the other figures of the drawings, the operation and actuation of the various components of the taping units will now be described in some detail.

It should first be noted that the conveyor belt **35** is driven by synchronized driving means which may be independent of the driving means which actuates the taping unit. However, it is preferable that both be driven by a common power source (motor) having a drive shaft **51** journalled through a support bracket **52** in turn mounted to a wall **53** of the housing **45**. A drive gear such as **54** drives a large gear **55** by means of a transferring gear such as **56**. Various cams and gears which will be subsequently described and which control the several operations of the tape-applying units (tape-feeding mechanism, brush arm movement, tape-measuring and cutting mechanism, etc.) are likewise driven by the power shaft **51**. All of the movements of the various mechanisms are synchronized with the movement of the carton C on the conveyor belt **35** so that the proper length of tape is precut and applied irrespective of any variation in the length of the carton.

Directing attention first to Fig. 19 of the drawings, it will be noted that all of the above-described mechanisms are contained in the housing **45** which comprises a central member **57**, divided by a central partition plate **58**. Side plates such as **59** and **60** close the sides of the housing and an outer housing member **61** may be mounted on the side plate **60** thereby affording a housing cavity **62**. Within the main housing **57**, two housing cavities **63** and **64** are provided for housing various elements of the machine. Thus much of the mechanism illustrated in Fig. 9 of the drawings is housed in the cavity **63**, and may include a drive gear and cams which control the movement

of taping arms. The tape feeding and cutting mechanisms, illustrated in Figs. 17, 18 and 20–24, are positioned in the housing cavity **64**.

Referring now to Figs. 16 and 20 of the drawings, it will be noted that the tape **41** is fed off of the rolls **42** down through a tape guide **65** positioned in the taping unit. The feeding of the tape is controlled by a tape-feed-drive roller **66** which is movable in and out of contact with the tape by means which will subsequently be described. Adjusting screw means such as **67** may be provided for controlling the pressure of the feed roll **66** against the tape **41**.

The bottom of the tape guide **65** is formed with a sharp edge, beneath which reciprocates the cutting blade **68** of the knife **69**, as illustrated in Figs. 20 and 24 of the drawings. The knife **69** is spring-loaded by means of the spring **70** urging the same in the direction indicated by the arrow in Fig. 20 so that the tape may be severed at the bottom of the tape guide **65**, which may be formed with a sharp shearing edge.

As shown in Fig. 20 of the drawings, before the tape leaves the bottom of the taping unit it passes over a guide roller **71** and through a wetting mechanism such as illustrated in Figs. 25–30 of the drawings, which wets the adhesive preparatory to its being applied to the carton. The wetting mechanism will be described subsequently as the description proceeds.

Referring now to Figs. 9, 17 and 18 of the drawings, it should be noted that the brush **43** rotates continually in the direction indicated by the arrows so that the same smooths the tape **41** onto the carton. The rotation of the brush is achieved in the following manner.

The brush bell-crank arm **44** is pivotally mounted on a shaft **72**. The shaft **72** is synchronized with, and driven by, the drive shaft **51** by means which will subsequently be disclosed. Mounted on the shaft **72** is a driven gear **73** which meshes with an intermediate gear **74** mounted on the bell crank arm **44**, which in turn meshes with another gear **75** mounted on the shaft **76** which also mounts the brush **43**. The driven gear **73** through the intermediate gear **74**, achieves the rotation of the brush gear **75**. Consequently the brush is rotated thereby in the direction indicated. It should be noted that the bell-crank arm **44** is rotatably mounted on the shaft **72** so that it is free to pivot in a counterclockwise direction, as shown in Fig. 16 of the drawings, without disrupting the above-described brush-rotation-gear-assembly. Thus as the carton C moves forward in the direction indicated by the arrow in Fig. 9 of the drawings, it pushes the brush ahead of it so that the brush mounted on bell crank arm **74** moves in an arcuate counterclockwise direction, the entire assembly moving up into the groove **78'** provided in the housing plate **60**. Thus the brush **43** is moved upwardly while continuously being pressed against the carton wall by spring tension, so that the tape is smoothed onto the carton, thereby covering the adjacent edges of the flaps of the carton and consequently sealing the same.

When the brush **43** has reached its highest position, the carton C will pass thereunder with the brush continuing to smooth the tape over the top of the carton. Simultaneously the cutting mechanism has been actuated so that the blade **68** severs the tape **41** to provide a length of tape sufficient to extend over the top of the case and down a short distance over the rear end thereof. To achieve this result a novel cutting mechanism and means for actuating the same is provided which will now be described in detail.

A cam **79** is securely mounted on the shaft **78** (Figs. 20 and 22) and retained thereon by a pin **77**. This shaft is periodically rotated by means which will be subsequently disclosed so that the cam **79** is rotated thereby. This cam **79** is provided with a notch **80** in the periphery thereof adjacent a tooth **81** projecting inwardly from an arm **82** pivotally mounted by pivot shaft **83**. At the lower

end of the arm 82 is pivotally mounted a knife arm 84 by means of a shaft 85. The coiled spring 70 is tensioned between shaft 85 and a projecting pin 86 formed on the partition plate 58. Thus the arm 82 with the projecting tooth 81 is constantly urged against the peripheral surface of the cam 79 and in the direction indicated by the arrow. When the cam 79 is positioned so that it presents only its normal peripheral surface to the tooth 81, it should be evident that the cutting edge of the knife blade 68 is positioned in spaced relationship with the tape 41. However when the cam is rotated so that the notch 80 is aligned with the tooth 81, the tooth slips into the notch thereby releasing the spring 70 to move the knife blade 68 against the tape. This shears the tape against the sharp bottom edge of the tape guide 65, as shown in Fig. 20 of the drawings. As the cam 79 continues to rotate, the tooth 81 rides out of the notch and the knife 68 is again displaced away from the tape. In this connection it should be noted that a coiled spring such as 87 may be provided for urging the knife blade 68 up against the cutting edge of the tape guide 65' to insure proper and instantaneous shearing action of the mechanism. It should also be noted that an adjusting device such as 87' may be provided to regulate and adjust the cutting mechanism.

After severing, the cut end of the tape 41 will follow along after the carton during its continuous movement on the conveyor belt 35 as shown in Figs. 5 and 6 of the drawings. The brush 43 continues to smooth the tape onto the top of the carton C until the carton has passed thereunder to the position shown in Fig. 5 of the drawings. At that time the spring action returns the brush 43 and arm 44 to its lowered position, but at the same time the carton passes under the second brush 46 which is continuously rotating in the direction indicated by the arrows in Figs. 9 and 16 of the drawings.

The brush 46 is likewise provided with gearing similar to the first brush arm, namely a driven gear 88, a meshing gear 89, an intermediate gear 90 and a brush gear 91. The driven gear 88 is driven by a sprocket chain 88' (Fig. 9) which is in turn driven by a sprocket wheel 89' mounted on the drive shaft 51. A sprocket wheel 90' may be provided adjacent the driven gear 88 to define the path of the chain 88'. A belt 92 then transmits power from driven gear 88 to drive gear 73 of the leading brush gear assembly as shown in Fig. 16. A positioning roller 93, spring suspended as shown, maintains proper tension on the belt 92.

As in the first brush arm 44, the second brush arm 47 is under spring tension so that the arm is constantly urged downwardly in an arcuate clockwise direction, as viewed in Fig. 16 of the drawings. It is obvious therefore that as soon as the rear top edge of the carton C has passed the rotating brush 46, the brush and arm will tend to lower itself, as shown in Fig. 6 of the drawings, permitting the brush to smooth the end of the tape 41 down along the rear end of the carton.

Since it was mentioned hereinabove that the brush arm 47 is constantly urged downwardly, it should be evident that means must be provided to move it back up to its raised position after it has fulfilled the brushing function, in order to prepare the same for the next carton. This is achieved by the arm 48. As noted in Fig. 9 of the drawings, a hook member 94 is formed at one end of the arm 48 and is positioned to engage a pin 95, said pin actually comprising an extension of the intermediate gear shaft 96. The arm 48 is formed with an angularly positioned extension arm 97, having a roller 98 mounted at the outer end thereof. This roller 98 abuts a cam 99 which is likewise mounted on the shaft 78. The rotation of the cam 99 is synchronized with the movement of the carton C on the conveyor belt by means which will become apparent as the description proceeds. It will be noted that the cam 99 is provided with a portion 100 of larger radius and a smaller radius portion 101. It will further be noted that the hook arm 48 is pivotally mounted on the shaft 72. Thus when the roller 98 abuts the smaller diameter portion 101 of the cam 99, the brush arm 47 is positioned in its lower position as shown in Fig. 9 of the drawings. However when the cam 99 is rotated to the position where the roller 98 rides up on the periphery of the larger radius portion 100 of the cam, the extension arm 97 is canted to the right, as viewed in Fig. 9 of the drawings, thereby pivoting the arm 48 upwardly in a clockwise direction. The hook end 94 engaging the pin 95 raises the brush arm 47 with the brush 46 attached thereto upwardly in an arcuate path and into the arcuate, bottom-opening slot 102.

The rotation of the cam 99 is synchronized in such a manner that the rear brush 46 is always moved to its raised position, as shown in Fig. 4 of the drawings, before the leading edge of the carton C has been moved to a position where it abuts the brush. So also the circumferential lengths of the cam portions 100 and 101 are so designed that the brush 46 is released while the carton C is passing thereunder and prior to the trailing edge of the carton having reached the brush. As the trailing edge of the carton passes the brush 46, it drops down and since it is continually spring urged against the rear end of the carton, the brush smooths the trailing end of the tape 41 onto the carton.

From the above description of the operation of the machine, it should be apparent that the taping units are designed to feed pre-cut lengths of tape synchronized with the continuous movement of the cartons on the conveyor belt 35. This of course presumes that the rate at which the cartons are fed into the conveyor belt system, is such that a carton is positioned in front of each pusher bar 38. If for some reason the flow of cartons through the conveyor system should be momentarily interrupted so that a vacancy occurs in front of one of the pusher bars, it is apparent that the feeding of a tape strip at this point would be highly undesirable and totally unnecessary. To take care of such an exigency, the machine has been so designed that the feeding of each strip of tape is controlled by the presence of a carton at that point. In the event that a vacancy occurs on the conveyor belt, no strip will be fed during the time that the vacant area is passing between the taping units. The mechanism for accomplishing this highly desirable function will now be described in some detail.

As was indicated in Fig. 1 of the drawings, the microswitch device 39 is positioned on the conveyor line 35 in spaced relationship with, and in front of the tape-applying units 36 and 37. A spring-pressed, microswitch-triggering-lever 103 may be pivotally mounted at a point such as 104 on the side of the conveyor belt 35 so that it is constantly urged into the path of the cartons on the conveyor belt. As the leading edge of the carton C approaches the trigger 103, it pushes the same aside so that the trigger pivots, thereby moving its leading edge 105 against a pin 106 protruding from the microswitch 107. The microswitch 107 is electrically connected to solenoid 108 so that the depression of the pin 106 in the microswitch 107 energizes the solenoid 108 which in turn reciprocates a core arm 109 in the direction indicated by an arrow in Fig. 11 of the drawings. The other end of the core arm 109 is pivotally connected as at 110 to the bottom end of a vertical leg 111 of a bell crank 112. The bell crank 112 is pivoted at 113, and has a horizontal arm 114 which abuts a vertically extending actuating arm 115 of a clutch member 116, as shown in Fig. 12 of the drawings. The horizontal arm 117 is of substantially half-round shape with an arcuate surface 118 and an undercut flat top surface 119, affording an edge 120 at the apex of the juncture of the flat surface 119 with the arcuate surface 118. A bevelled surface 121 is provided by undercutting an end segment of the arm 117, and an outwardly projecting pin 122 is formed at the outer end of the arm. The opera-

tion and functioning of the clutch **116** will become apparent as the description proceeds.

Referring now to Fig. 15 of the drawings, it will be noted that a hub **123** is immovably mounted on the outer end of the shaft **78** by a pin **123'**. This hub is formed with an arcuate-shaped groove **124** extending transversely across the periphery of the hub until it abuts a front retaining wall **125**. The retaining wall **125** is formed with a smaller groove **126** adapted to accommodate therein the pin **122**, the clutch arm **117** proper being accommodated in the groove **124**.

Mounted immediately behind the hub **123** is the large gear **55** which is formed on a central hub **127**. The hub **127** in turn is formed with a central bore **128** which is adapted to accommodate therein the hub **123**. Opening to the inner surface of the bore **128** is a transverse slot **129**, the function of which will become apparent as the description proceeds. It will further be noted that the cam **99** is also formed with a central bore **130** enabling the same to be fitted over the hub **127**. On the opposite side of the gear **55** another hub **131** is provided which is of somewhat larger outer diameter than the hub **127** and within which the slot **129** is formed. This hub **131** is in turn adapted to fit into another central bore **132** which in turn is formed in another cam **133**, the function of which will be disclosed as the description proceeds. All of these cams and hubs are retained in telescoped relationship by means of a pair of retaining plates such as front plate **134** and rear plate **135** which are affixed as by bolts **136** and **137** assembled respectively in threaded openings **138** formed in hub **127** and threaded openings **139** formed in hub **131**.

To appreciate the functioning of the clutch device **116**, it should be noted that in the absence of actuation of the solenoid **108**, the shaft **78** with the hub **123** and the clutch **116** positioned therein remains stationary while the large gear wheel **55** (driven by drive shaft **51** and gears **54** and **56**) and the cams **99** and **133** rotate continuously. However when the solenoid is energized by the passage of a carton on the conveyor belt to trip the microswitch **39**, the bell crank **112** tilts the horizontal arm **114** out of the path of the clutch-actuating arm **115**, thereby permitting a spring **140** to rotate the horizontal arm **117** of the clutch member sufficiently to permit the edge **120** to project into the slot **129** formed in the hub **131** when the same is rotated into aligned position therewith. Thus the hub **123** is engaged, thereby causing the shaft **78** to rotate. It should be noted that the bevelled segment **121** of the clutch arm **117** affords sufficient clearance during the rotation of the clutch to avoid abutting the ungrooved portion of the wall of the bore **128**.

Upon the occurrence of the aforementioned event, another cam **141** as shown in Figs. 20 and 22 of the drawings, begins to rotate with the shaft **78**, thereby cooperating with tape-feeding control mechanism in a manner which will now be described.

Like the cam **99** the cam **141** is formed with a large radius portion **142** and a reduced radius portion **143**. A bell crank **144** having arms **146** and **147** is pivotally mounted as at **145**. To the end of the arm **146** is rotatably mounted the tape feed drive wheel **66**. A roller **148** is mounted at the end of the other arm **147** and bears against the cam **141**. It will be noted that the spring **87** urges the arm **147** with the roller **148** mounted thereon continually against the cam **141**. Thus it will readily be perceived that when the roller **148** is riding on the periphery of the larger radius portion **142** of the cam **141**, the tape feed roller **66** is moved out of contact with the tape **41**, as shown in Fig. 20 of the drawings. When this occurs, no tape is fed. However when the cam is rotated so that the roller **148** is free to drop down onto the periphery of the smaller radius portion **143**, the tape feed roller **66** is moved into contact with the tape **41**. Since the roller is constantly rotating in the direction indicated by an arrow in Fig. 20 of the drawings, the tape is thereby fed down through the taping unit and applied by the brushes **43** and **46** to the carton C. The ratio of the circumferential length of the reduced radius portion **143** to the larger radius portion **142** of the cam **141** and the rotation of the cam itself is so synchronized with the movement of the carton C on the conveyor belt **35**, that the length of tape which is fed and cut by the cutting mechanism is such that it will be exactly sufficient to extend from a point approximately two inches down from the top along the front end of the carton, across the top thereof and then down along the back end wall of the carton a similar distance of approximately two inches. It should be noted that the cam **141** may be made in two parts to include a complementary part **141'**. These parts may be rotatably adjusted with respect to each other by means of set screws such as **142'** so that the ratio of the smaller radius portion **143** to the larger radius portion **142** may be varied and adjusted, thereby varying the length of the tape feeding period or the interval between feedings.

Of course the above-described tape feeding step occurs only when a carton is positioned on the conveyor belt in the space provided therefor before the pusher arm **38**. In the absence of such a carton, the clutch, not being actuated by the solenoid **108** and the bell crank arm **114**, does not engage the drive gear **55** and therefore does not rotate the shaft **78** and the cam **141** mounted thereon. However when the clutch is actuated, it is rotated to present the edge **120** in a position where it will protrude into the slot **129** at the instant when the rotation of the gear **55** moves it, the slot, into alignment with the clutch edge **120**. The clutch **116** is tilted or rotated into engaging position at the instant when the leading edge of the carton hits the microswitch trigger **103**. However, the shaft **78** with the tape feeding cam **141** and the tape cutting cam **79** mounted thereon does not begin to rotate until the slot **129** is rotated to a position where the clutch engaging edge **120** is aligned therewith so that it can protrude therein. Since the rear end of the carton C is always in the same position, namely abutting the pusher arm **38**, the length of the carton C, namely the distance between the leading edge and the pusher arm **38**, governs the length of tape which is fed and cut for that particular carton. It should therefore be apparent that the length of tape which will be fed for application to the carton, will be of exactly the proper length regardless of any variation in the length of the carton itself. Obviously this is a most desirable feature enabling the machine to be used continuously on cartons of varying lengths without necessitating stopping of the machine to adjust it for each new box length fed into the conveyor system.

During the interval when the tape feed drive wheel **66** is moved out of contacting relationship with the tape **41**, the tape might tend to be drawn back to the tape roll **42** or to drop down through the taping unit. This is especially true in the bottom unit where the force of gravity is freely exerted on the tape. To prevent this return movement of the tape, a brake such as **149** may be provided as shown in Figs. 16 and 17 of the drawings. This brake may comprise a toggle arm **150** pivotally mounted as at **151** in a bracket **152** and continually urged by a coil spring such as **153** in a direction away from the roller **66** but toward the tape, the end of the toggle arm **150** abutting the tape **41**. While the feed roller **66** is feeding the tape downwardly, the arm **150** is pivoted in the direction shown in Fig. 17 which permits the tape to freely pass thereby. However, when the feed roller **66** is not exerting any force to move the tape **41**, the force of the spring **153** is sufficient to cause the toggle arm **150** to move upwardly into abutment with the tape **41** thereby preventing the movement of the same during the inoperative interval of the tape feeding mechanism.

It should of course be appreciated that prior to the applicatoin of the tape to the carton, the adhesive surface of the same must be moistened. In applying the moisten-

ing agent, viz. water, it is important that the proper amount be applied, i. e. it should not be in excess and at the same time it is important that sufficient moistening agent should be applied to insure proper adhesion of the tape to the carton. To achieve this function, a novel wetting mechanism has been provided which is illustrated in Figs. 25–30 of the drawings.

This wetting mechanism, indicated generally by reference numeral **154**, is positoined below the cutting mechanism as shown in Fig. 25 of the drawings. Basically it may comprise a water container such as a bottle **155** removably supported in inverted position in a reservoir **156**, which in turn is connected by a tube such as **157** to a tank **158**. Within the tank **158** is rotatably positioned a roller **159** with a sponge **160** mounted thereon. The wetting sponge **160** is, of course, replaceable and is positioned so that it rotates with a bottom portion thereof submerged in the water which may partially fill the tank **158**. A front upper portion thereof abuts the tape **41** as shown in Fig. 25 of the drawings. Naturally the adhesive side of the tape should face the sponge **160**.

On the other side of the tape **41** may be rotatably positoined a novel roller member **161** which affords a bearing surface for the tape opposite the point of contact by the sponge roller **160**. This roller **161** is formed with a plurality of capillary spaced circumferential grooves such as **162** separated by a plurality of wider grooves such as **163**. This particular design, namely the grooves **162** and **163**, are provided for the purpose of collecting any excess liquid and further are helpful in regulating the amount of liquid applied to the tape. It should be apparent that the width of the tape **41** must be less than the width of the sponge **160** in order to insure that the entire adhesive surface of the tape will be wetted. Thus a certain amount of excess liquid is applied at the outer edges of the tape **41**. This excess liquid is collected in the grooves **162** and carried down into the collecting trough **164**. Furthermore the grooves and spaces **163** are provided for the purpose of permitting portions of the tape to bend back into the grooves and away from the sponge **160** in the event that the pressure exerted by the wetting roller **159** is excessive. Tube **157** is provided with a branch **165** so that the excess liquid collected in the trough **164** may be returned to the line **157** and subsequently returned to the wetting tank **158**.

In Fig. 27 of the drawings it will be noted that a roller **166** is provided in the tank adjacent to roller **159** so that it presses against the sponge **160**. This is provided for the purpose of regulating the amount of liquid in the sponge **160** by squeezing out any excess liquid, thereby assisting in preventing excess liquid from being applied to the adhesive of the tape **41**. The rollers **159** and **166** are both rotated and controlled by a novel mechanism which will now be described in some detail.

The peripheral surface of cam **133** is serrated as shown at **167**. This affords a friction surface which abuts a rubber roller **168** mounted on a shaft **169** which also has a gear **170** mounted thereon. The gear **170** is adapted to mesh with a pair of gears **171** and **172** positioned in the cavity **63** with respective shafts extending into cavity **64**. Slot discs **171'** and **172'** connecting to discs **171''** and **172''** are mounted on the outside of the tank **158** and have drive shafts such as **173** and **174** upon which are mounted the rollers **159** and **166** respectively. Thus it will readily be perceived that the wetting roller **159** and the squeezing roller **166** are controlled by cam **133** in such a manner that they are not rotated unless tape is being fed through the units.

Wetted tape has a tendency to curl up, thereby interfering with the application of the tape to the carton. To prevent this curling, a tape stiffening device has been devised which will now be described. Referring then to Fig. 33 of the drawings it will be noted that the tape feeding roll **66** is formed with an annular groove **175** at the center of the circumference thereof. A complementarily-shaped free roller **175'** is rotatably mounted in aligned position on the opposite side of the tape **41**. This wheel is formed with an annular protruding rib **176** adapted to mesh with the groove **175**. As the feed roll **66** rotates against the roller **175'**, the tape **41** therebetween is creased as at **177** thereby stiffening the same and preventing it from curling.

In describing the operation of the tape-feeding and cutting mechanism hereinabove, it was stated that the cams **79** and **141** were actuated or rotated only when the shaft **78** was rotated. It can, therefore, be appreciated that it is important that this shaft rotates only when the clutch is actuated. Obviously a certain amount of inertia might cause the shaft to rotate even after the clutch has been disengaged. To prevent such rotation, a stop wheel **180** may be secured on the shaft **78** by means of a pin **181**. This stop wheel **180** rotates directly beneath a pointed stop pin **182** mounted in a housing **183** affixed to the partition plate **58**. The stop pin **182** is spring-urged downwardly and is adapted to fit into a notch **184** formed in the periphery of the wheel **180**. Thus when the shaft **78** has been uncoupled from the drive wheel **55**, the spring urges the pointed pin **182** down with sufficient force to stop the rotation of the wheel and the shaft attached thereto as soon as the notch **184** is rotated into alignment therewith. The spring is so rated that it is not sufficiently strong to prevent the rotation of the shaft **78** when the same is coupled to the driving mechanism of the machine.

It should be apparent from the foregoing description and drawings that I have provided an improved machine for sealing cartons and the like by the automatic mechanical application of lengths of tape applied in such a manner that they join together the adjacent edges of the flaps of the carton in dust-proof sealed relationship and also secure the flaps to the end walls of the containers. This is accomplished by adhering a length of tape extending from a point approximately four inches from the top and/or bottom on the end wall of the carton, extending entirely across the top and/or the bottom of the carton, and then extending down or up, as the case may be, a distance of approximately four inches on the rear end wall of the carton. The taping units are adapted to be used in combination with a flap gluing machine or may be used independently thereof. The machine is further designed to accomplish its sealing functions while the cartons are being moved continuously and automatically as by the continuous conveyor belt. Means are provided in the machine for severing the tape in varying lengths as dictated by the length of the carton itself. Thus each carton is provided with a tape which is exactly the correct length for the carton to which it is to be applied. No manual adjustment is required to vary the lengths of tape in accordance with the lengths of the cartons. The taping units may be so mounted in the carton sealing machine that they may be moved vertically to accommodate varying heights of cartons by simple manual means. Tape feeding means is further provided, which is controlled by the presence or absence of a carton in its allotted space in the conveyor belt. If a vacancy should occur on the conveyor belt, no tape will be fed. Simple but effective and sturdy clutch means are provided for automatically coupling or uncoupling certain of the actuating means for performing some of the various functions of the machine as governed by the presence or absence of a carton on the conveyor belt allotted space and for timing the tape feeding and cutting mechanisms in accordance with the length of carton to be taped. Novel wetting means is also provided for wetting the adhesive on the tape and for controlling the degree of wetting to insure maximum adhesion of the tape to the carton.

It is believed that my invention, its mode of construction and assembly, and many of its advantages should be readily understood from the foregoing without further description, and it should also be manifest that while a preferred embodiment of the invention has been shown

and described for illustrative purposes, the structural details are nevertheless capable of wide variation within the purview of my invention as defined in the appended claims.

What I claim and desire to secure by Letters Patent of the United States is:

1. In a carton taping machine of the character described; at least one taping unit mounted adjacent conveyor means for continuously moving cartons having closure flaps in spaced relationship past said unit, said unit having means for mechanically feeding a length of adhesive tape so that the end thereof projects into the path of said carton, means for applying said tape to the carton whereby said flaps are sealed together and the sealed flaps are adhered to the front and rear end walls of the carton, said first-mentioned means remaining inoperative in the absence of a properly positioned carton, tape cutting means, and means for mechanically actuating said tape cutting means to afford varying lengths of tape as determined by the length of the carton to be taped, said means for applying said tape including a plurality of rotating brushes positioned to mechanically press and smooth the tape against the leading end of the carton, around the corners and over the adjacent edges of the flaps and against the trailing end of the carton.

2. The carton taping machine of claim 1 in which said brushes are mounted on spring-pressed arms, gear means mounted on said arms for transmitting power to rotate said brushes, and said arms pivotally movable in arcuate paths to accommodate the passage of the carton and follow the path of application of the tape to the carton without interrupting the transmission of power to the brushes.

3. The carton taping machine in claim 2 in which said arms are positioned in aligned spaced relationship along the path of the conveyor means, and means for withdrawing the trailing one of said arms from the path of the next succeeding carton on the conveyor after the same has completed the operation of applying the tape to the trailing end of the preceding carton.

4. The carton taping machine of claim 3 in which said last-mentioned means comprises a pivotally-mounted bell-crank hook member, one end of said hook member engaging said brush arm, and a cam rotatable to periodically pivot said hook-member whereby to withdraw said brush arm from the carton path, the rotation of said cam controlled by means synchronized with the movement of the carton on the conveyor.

5. The carton taping machine of claim 4 in which the periphery of said cam is formed with a large radius segment and a small radius segment and a roller is mounted in one end of the bell-crank member, said member biased to spring urge said roller into abutment with the periphery of said cam.

6. The carton taping machine of claim 1 in which said tape feeding means is controlled by cam actuating means, said cam actuating means in turn being synchronized with the movement of the carton on the conveyor.

7. The carton taping machine of claim 6 in which said tape feeding means comprises, a pivotally mounted bell-crank having two arms angularly disposed one to the other, a rotatable tape-feeding wheel mounted on the end of one of said arms, a roller mounted on the end of the other arm, said cam actuating means mounted on a shaft, said roller spring-urged against the periphery of said cam, the rotation of said shaft controlled by means responsive to the presence of a properly positioned carton on the conveyor, said cam designed to intermittently pivot said tape-feeding wheel into operative contact with a tape extending into the tape unit from a continuous source of supply.

8. The carton taping machine of claim 7 in which said cam is provided with a larger radius periphery and a smaller radius periphery, the position of said peripheries in respect to said roller controlling the movement of said tape-feeding wheel.

9. The carton taping machine of claim 7 in which a driven gear is rotatably mounted on said cam shaft and clutch means is provided for coupling said cam shaft to said driven wheel.

10. The carton taping machine of claim 9 in which said clutch means is controlled by magnetic actuating means, said last-mentioned means in turn energized by the passage of a carton over switch means positioned on said conveyor, whereby the absence of a carton from the provided position on said conveyor prevents the feeding of tape through the taping unit.

11. The carton taping machine of claim 12 characterized by cutting means positioned within the unit, said cutting means adapted to cut the tape into lengths proportional to the length of the carton to which it is to be applied.

12. The carton taping machine of claim 11 in which said cutting means comprises a cutting blade mounted on the end of an arm adjacent the tape, said blade and arm disposed in a plane perpendicular to the plane of said tape, the other end of said arm connected to the lower end of a pivoted actuating arm, said actuating arm having means adapted to reciprocate said blade against the tape to sever the same.

13. The carton taping machine of claim 12 in which said last-mentioned means comprises a tooth positioned intermediately on said actuating arm, said tooth and actuating arm being spring-urged against the periphery of a rotating cam, said cam having a notch formed in the periphery thereof, the seating of said tooth in said notch causing the severing reciprocation of the cutting blade.

14. The carton taping machine of claim 13 in which said cam is mounted on a shaft, the rotation of said shaft being controlled by a magnetic clutch responsive to a microswitch positioned in the path of the cartons on said conveyor whereby the intervals between cutting reciprocation of said blade and consequently of the lengths of tape cut are determined by the length of the carton passing said microswitch.

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