United States Patent

Seragnoli

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[54] MACHINE FOR FORMING AND WRAPPING UP INDIVIDUAL ARTICLES SUCH AS CANDIES

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[51] **Int. Cl.** **B65b 11/32**, B65b 11/42

[58] **Field of Search** 53/234, 225, 378

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Assistant Examiner—Neil Abrams

Attorney—Robert E. Burns and Emmanuel J. Lobato

[57] **ABSTRACT**

An intermittently rotating radial section wheel transfers articles along a guideway from a first stop station to a second stop station. Lengths of wrapping material are successively and intermittently fed transversely of said guideway. At the second stop station an intermittently rotating radial pliers of a wrapping wheel bends the wrapping material in U-shape about an article. During movement to an outlet station, the wrappings are folded over the article by wrapping members. Different types of wrapping can be carried out with different wrapping members.

2 Claims, 9 Drawing Figures

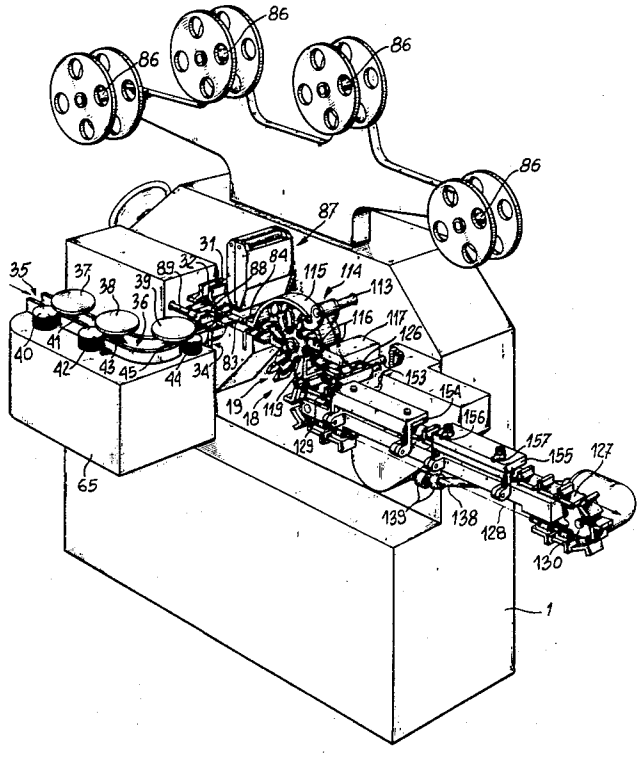

FIG. 1

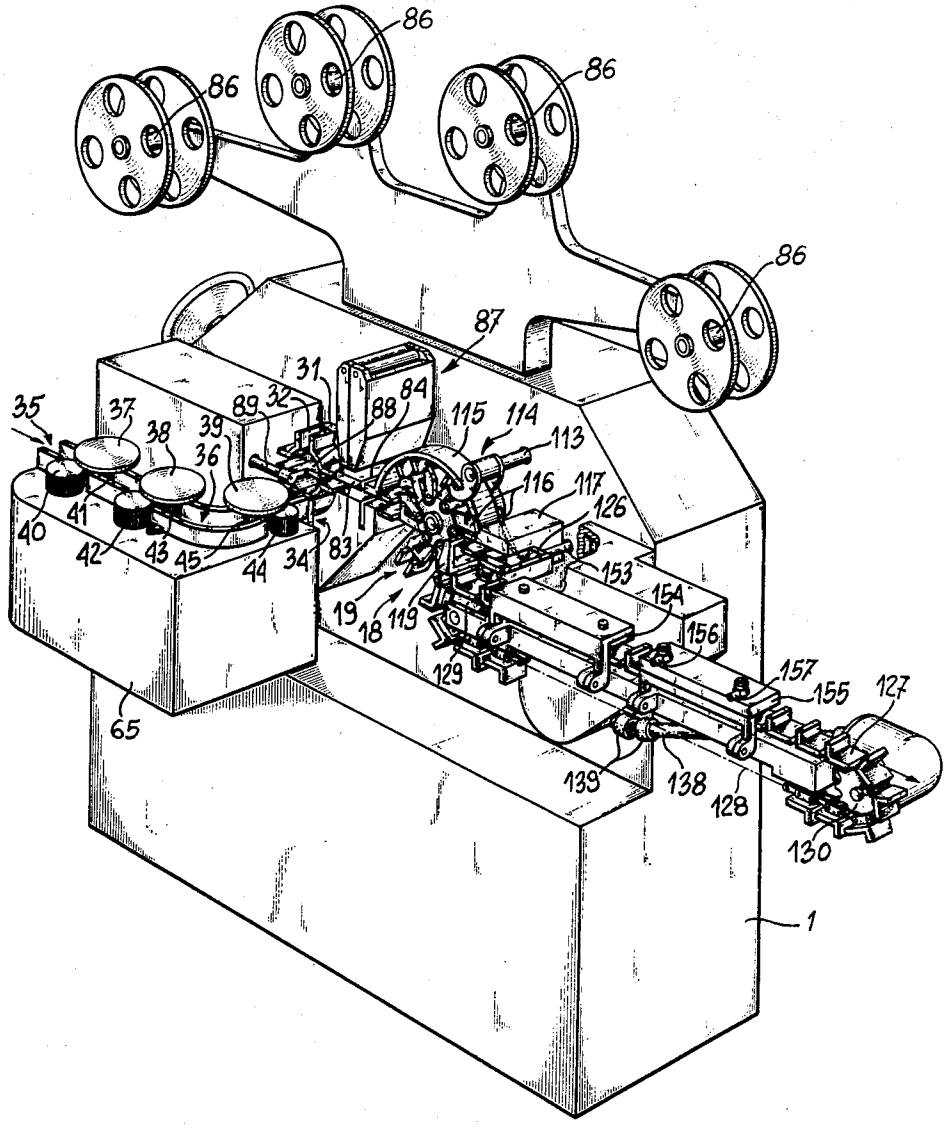
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FIG. 2

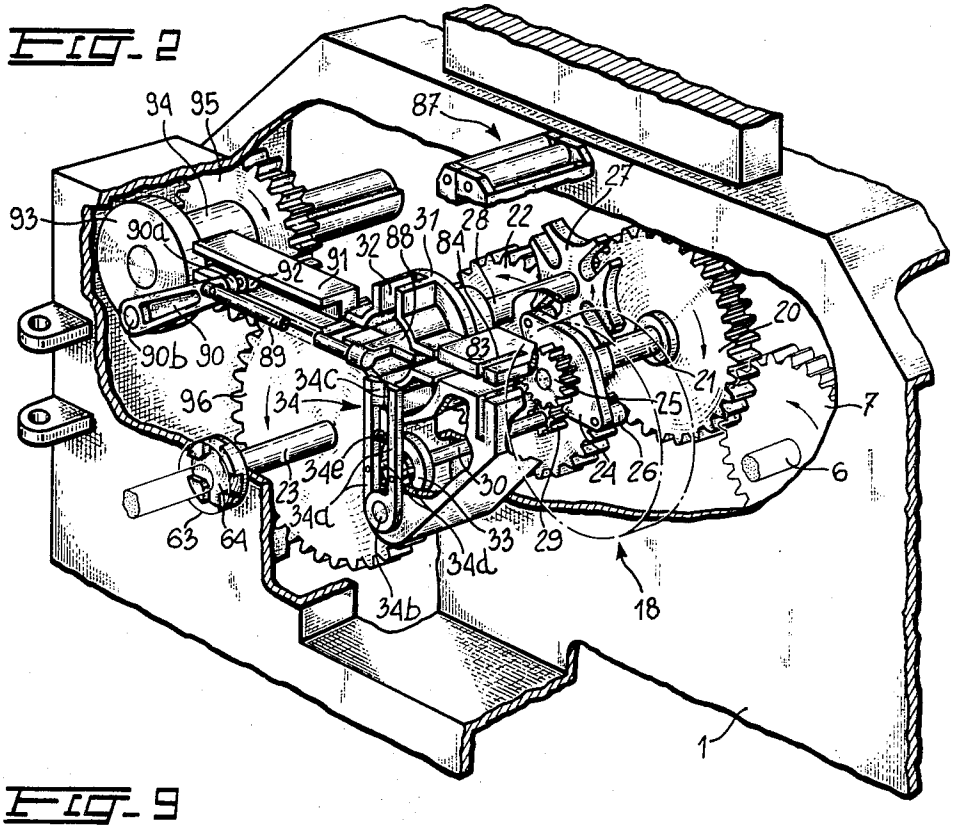
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FIG. 9

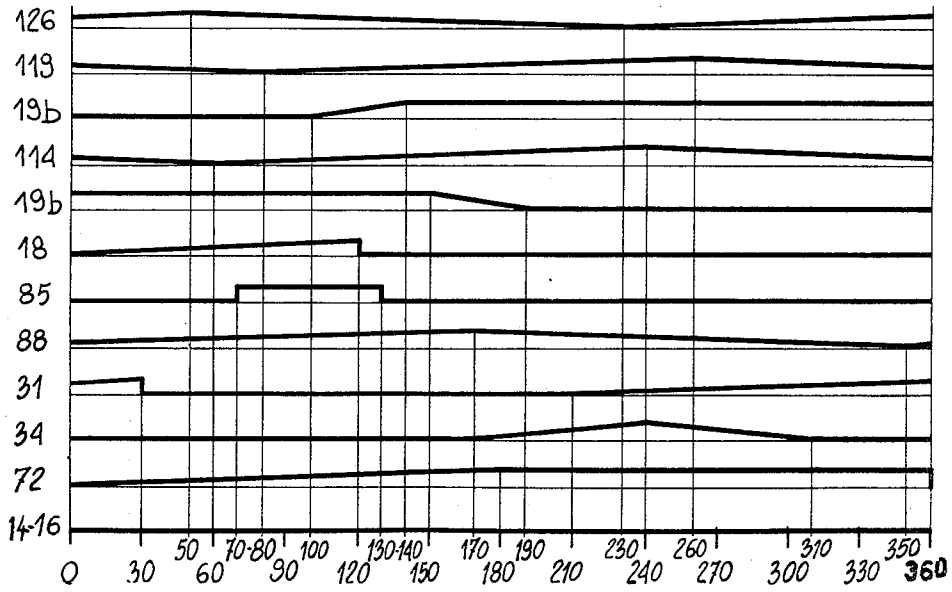
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FIG. 3

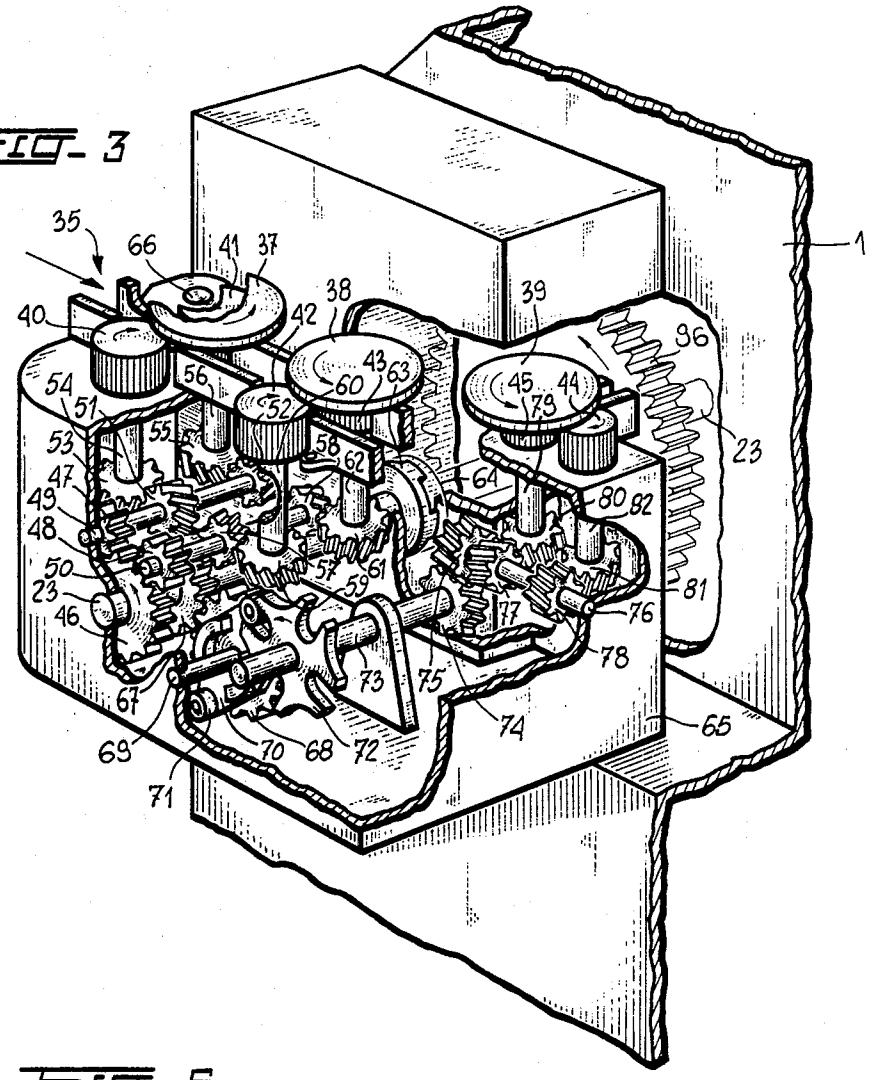

FIG. 6

FIG-2	FIG-4	FIG-5
FIG-3		

FIG-4

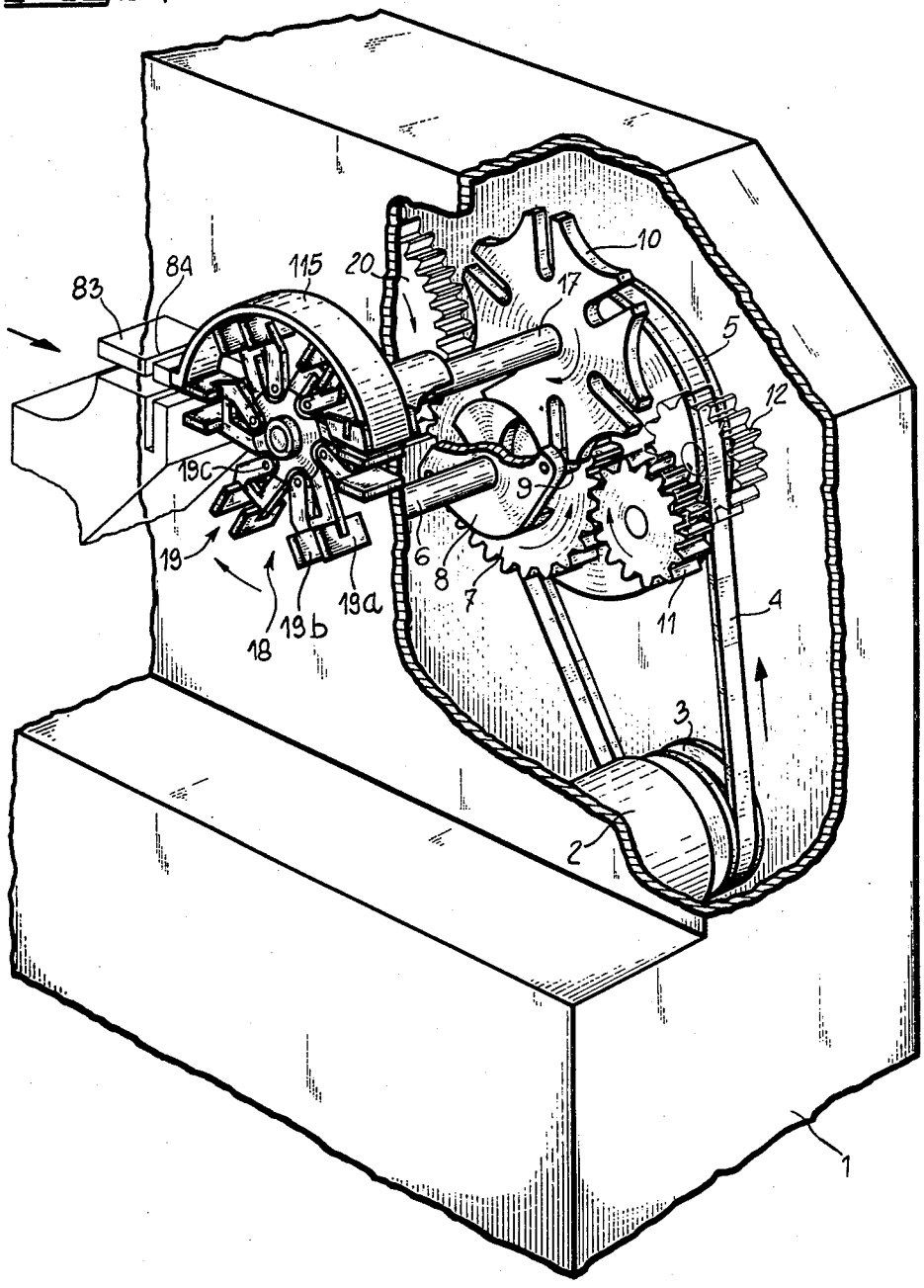

FIG. 5

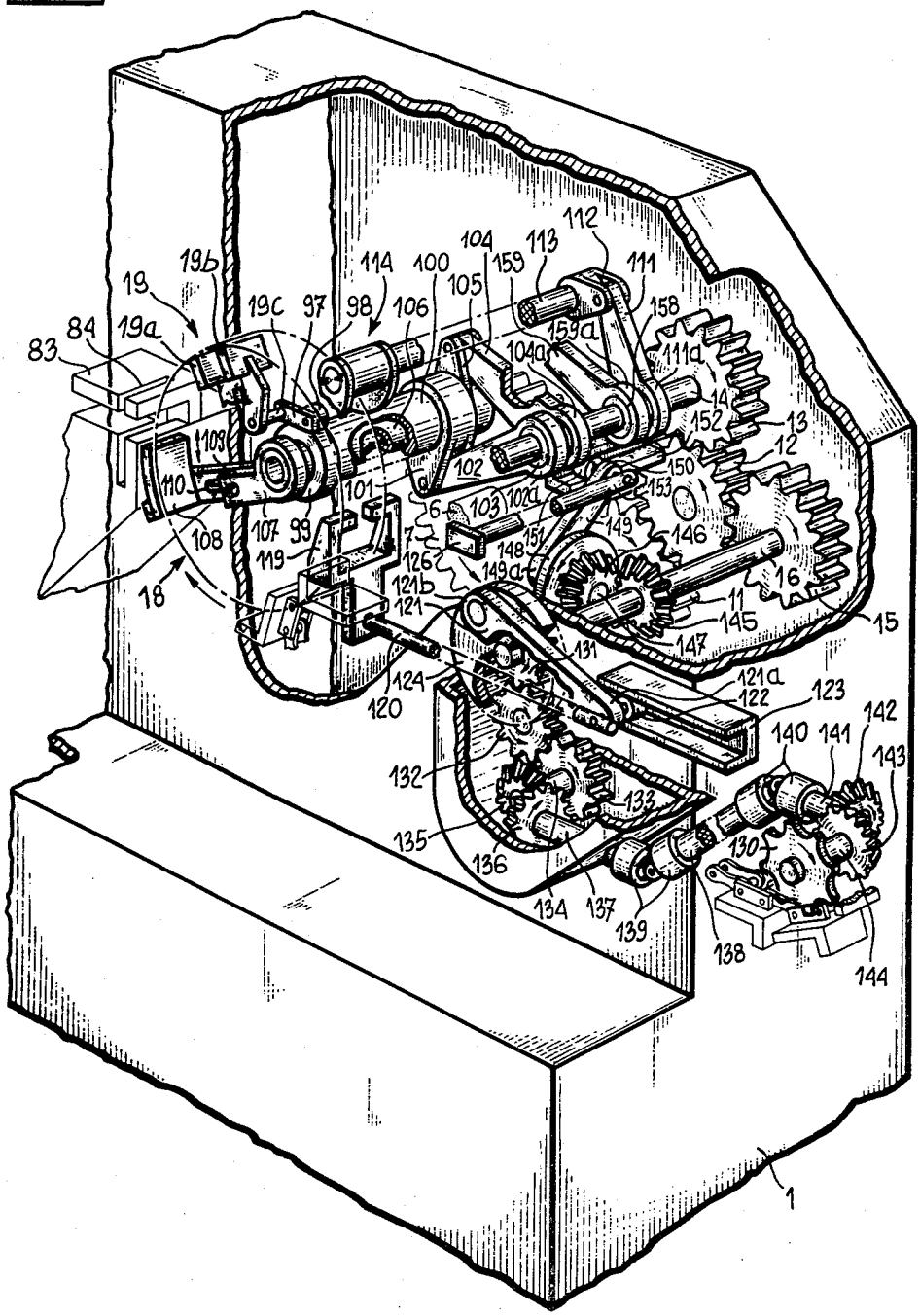
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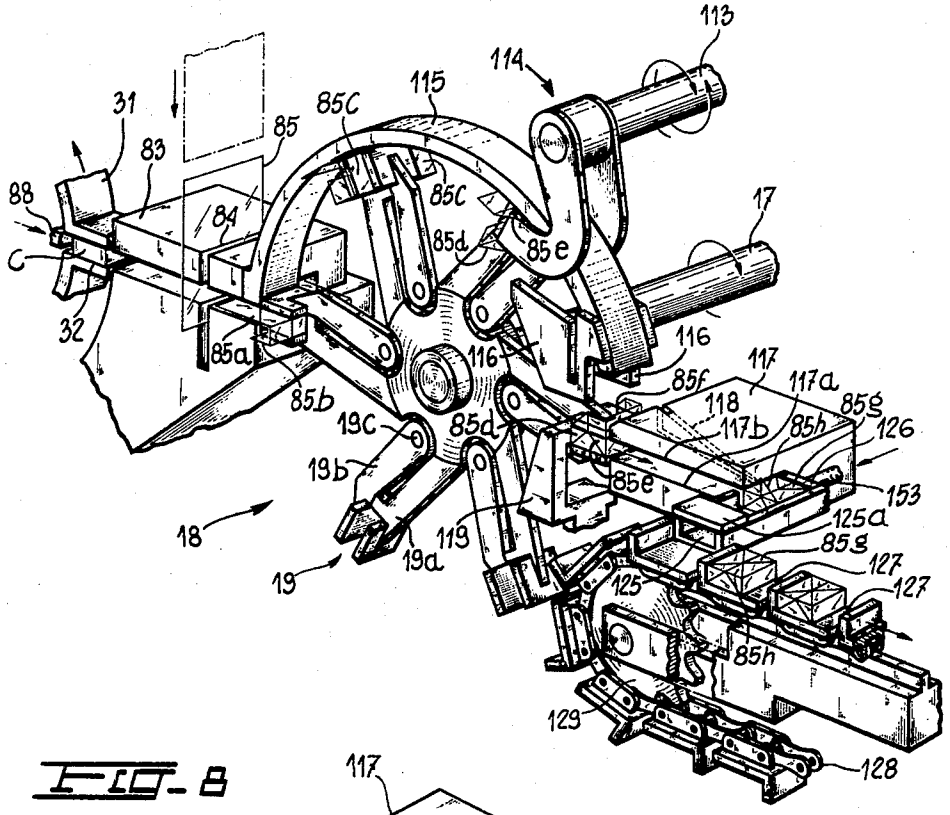
FIG. 7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117a
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85g
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117b
85h
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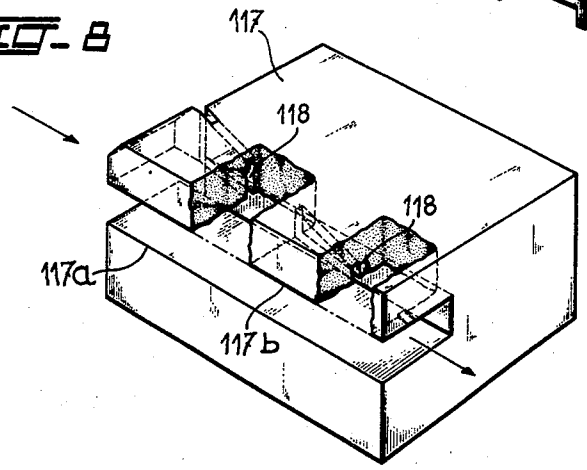
FIG. 8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MACHINE FOR FORMING AND WRAPPING UP INDIVIDUAL ARTICLES SUCH AS CANDIES

This invention relates to machines for forming and wrapping up individual articles, for example candies and other similar products, from a continuous plastic material web.

Machines for performing such a function are known.

Essentially, known machines are structurally conceived so as to supply the continuous plastic material web through a structure comprising members for subsequently cutting this web into individual pieces in timed relationship with reciprocable members which, in turn, are designed to supply these pieces in a rapid sequence to further members of the machine intermittently operating for the subsequent individual wrapping up of such pieces in a predetermined manner amongst which are, in the terms of the art, simple bag or double knot wrapping pin wrapping, and others.

After operation by these wrapping up members, the individual wrapped up articles are moved away from the machine. They are then, depending on known requirements, either bulk collected, or supplied to a further machine providing for a further working or processing step, such as collecting and wrapping up in a bundle a predetermined number of these previously wrapped up individual articles.

These known machines have notoriously attained substantially unsurpassable limits in operating speed, that is a top speed of approximately 500 individual wrapping a minute. This top speed in the specific application field is referred to as first speed where these machines are of course considered as first or one speed machines. Limitations to the first speed are due to the particular characteristic operative structure of certain members of the machine, such as the above-mentioned reciprocable structures of the supply members, and to the functional co-ordination of these members with further members of the machine, and principally between said supply members and wrapping up members which are in fact also capable of satisfactorily normally operating at a higher speed.

With the purpose of obviating the limitations ensuing from such structures and co-ordinations for the operating members of these known machines in order to exceed the above speed limitations and to attain a larger number of wrappings in time unit, it has been proposed to provide for so-called multi-wrapping line machines, involving a plurality of single radially supplied operative units (wrapping wheel and elements).

A proposal for providing multi-wrapping line machines, that is machines having a plurality of wrapping wheels is to arrange these wrapping wheels on a single axis and to connect them to a drive system driven by a single motion supply. With such machines, that is by machines having at least one double wheel with respective wrapping up elements, the output speed could be increased, but as apparent for dynamic requirements this speed can never be increased proportionally to the number of operative units being used, that is doubled, tripled, etc., since the alternately operating masses accordingly would be increased, thus reducing the unitary speed and hence the total speed.

Thus, if with a single wrapping line machine, that is a machine having a single wrapping up wheel involving rotatably and linearly reciprocable moving elements, the typical top or one speed of wrappings per minute is attained, it is apparent that by doubling these moving elements connected to a single motion supply, this speed cannot be doubled since the added elements, and those obviously dimensionally increased, will just considerably increase the moving masses.

Further, where for these multi-wrapping wheel machines the problem is also considered of concurrently supplying the individual articles to be wrapped up to each wrapping up wheel, either where these articles to be wrapped up are locally provided by subsequently cutting them from a continuous web, or where they are previously formed according to a chain sequence so as to be individually divided when being supplied, and hence in both instances alternatively individually and subsequently intermittently radially supplied to the wrapping up wheels,it is evident that in such machines the time unit output

speed increase can never be proportional to the increase in the individual wrapping up wheels and that they will never practically attain any particular technical advantage over the use of a corresponding number of individual conventional machines.

The technical and economical properties possibly resulting from providing these multi-wrapping line machines are readily apparent to be still less substantial and productive when considering the above-mentioned single axis, multi-operative unit structure because of the position as necessarily taken in the machine assembly by such operative units in the respective single configuration thereof of rotatable wheel and moving bending elements, which would limit the liability of this machine to be embodied as a single wrapping style machine, thus devoiding it of the universal character as conventionally appreciated in the particular use thereof just for the practical and economical advantages resulting from using a universal single-wrapping up line machine.

The present invention therefore sets out to provide a machine for forming and wrapping up individual articles, such as candies and other similar products, from a continuous plastic material web, capable of attaining a high output speed by a single operative line for the wrapping up steps, that is having a single wrapping up wheel, thus retaining the main universal operation feature of different wrapping styles, in accordance with the appreciated novelty qualities of the conventional machines.

In order to practically produce such a wrapping up machine, contrary to the principle as based on increasing the operative units, or on the plurality of single-axis wrapping up wheels, which as above stated involve an increase in moving masses both in the members comprising the individual wrapping up wheels and in the members being designed to supply the articles to be wrapped, we instead started from the converse principle, that is of rationalizing the operating times and substantially reducing the moving masses.

Following this principle, we provided a machine assembly having such co-ordination of the movements between the kinematic members as to allow an accurate distribution of time-phase relationship and an adequate function association to remove idle times and to allot closely sufficient movement and dwell times to each operating member to ensure the performance of the respective operations.

We attained this by a departure from conventional structural plans for these machines which, as known, contemplate the use of reciprocable operating members or, as abovementioned, in the attempt to increase the typical top speed of these machines, to adopt multi-wrapping up head or wheel machines, by providing the shaping and supply member for the individual articles or candies as a rotatable head or wheel, and so as to impart thereto a unidirectional intermittent rotational movement in timed relationship with an unidirectional intermittent rotational movement of the wrapping up head or wheel.

Therefore, an important feature of this machine is in the above-cited construction, by which movement times and dwell times, respectively, can be achieved for the two shaping and supply heads of wheels of the individual articles or candies and, respectively, wrapping up said articles or candies, intended for the shaping and supply head or wheel to meet the requirement of conveniently inserting therein the length of continuous web for candy cutting and, respectively, the transfer of said previously cut candy to the wrapping up head or wheel, and, as to the latter, the requirement for transferring the candy along the wrapping up line in connection with the subsequent wrapping up operations.

A further important feature of this machine is also its driving or control unit, consisting of a single kinematic structural arrangement having directly interconnected rotating members unidirectionally moving which, extremely significant in this kind of automatic paper wrapping machines for attaining high operating speed, eliminates the use of flexible and/or any discontinuous operating members, such as chains and other like members.

A further important feature of the machine according to the invention is also in the particular structural configuration of the rotatable head or wheel supply member and its particular insertion in the kinematic structure, capable of operating this rotatable head or wheel so as to supply the individual articles to be wrapped up in a rapid sequence with the aid of a member for transferring these articles in the cycle of wrapping up operations, the latter member being operated in turn by a uniform movement.

With a machine incorporating said principle features, and owing to an accurate design for rationalizing the workpiece paths, as well as removal of reciprocating movements of some members and particularly the shaping and supply head for the articles in the wrapping up line, an operating speed was attained more than twice that attained by hitherto known and/or proposed machines.

Finally, a further but not last significant feature relating to the machine according to the invention is that this machine can be produced with a particularly simple structure, which is simple and reliable in use, which has an extended life and, above all, also has a comparatively low cost price when considering the high operative performances provided thereby.

According to the main aspect of the invention, there is provided a machine for forming and wrapping up individual articles, such as candies and other similar products, from a continuous plastics material web, comprising an intermittently rotating radial section wheel for transferring said articles from a first stop station for successive sections where the articles from a supply member are inserted to a second stop station for said sections; a transfer guideway from said second station defined by two parallel facing surfaces; means transversely intersecting said guideway for intermittently feeding subsequent lengths of wrapping up material; pusher means for transferring subsequent articles and related wrapping up material lengths engaged and urged by the respective articles along said guideway and between said surfaces from said second station to one of the gripping pliers in an intermittently rotating radial pliers wrapping up wheel in a stationary condition at said first stop station, so that each length along said guideway is subsequently bent over in a U-shape about the respective article; said wrapping up wheel, during its movement from said first stop station to the outlet station, subjecting the wrappings of subsequent articles at intermediate stations to the action of bending members, which members are interchangeable in accordance with the pre-determined type of wrapping.

Conveniently, the wrapping up wheel is associated with a fixed bending member, tangential to and at least partially surrounding the circular transfer path of the articles entrained by the pliers. In connection with a versatility feature of the machine according to the invention, said bending members comprise, for simple or double knot wrapping styles, a first bending member moveable transversely of said guideway for folding up one of the edges of the U-bent length on the outer side with respect to said wrapping up wheel for the pliers retained article; said fixed bending member, tangential to and surrounding the circular transfer path of said article side, for clinching the second edge of the length on said article during transfer thereof, so as to provide a prismatic tubular wrapping; and finally further known bending members for these wrapping styles, such as those according to our Italian Pat. No. 466,665.

For the so-called tip wrapping style, in addition to the abovementioned fixed bending member, tangential to and surrounding the circular transfer path of the article for clinching one of the edges of the U-bent length on said outer side of said article, there is provided a substantially fork-like bending member, swingably moving on the pliers wheel about an axis parallel to the axis of said pliers wheel, for bending the end areas of a wrapping face against the article heads, at right angles to said side; a fixed bending member, substantially comprising two plates parallel to the faces of the pliers wheel and adjacent located on either side thereof, for orthogonally folding up as tips parallel to one another the wrapping ends during the movement of said pliers wheel to said outlet station; a guide for clinching said edge on the subsequent article face, thus completing the folding up of said tips, and comprising a bending surface, as an extension of said outlet station and gradually curving in the feed direction of the articles, for engaging and progressively folding up one of said tips on the article body; and ejecting means for forwarding the subsequent articles from said pliers as stationary at said outlet station along said bending surface to the machine outlet.

Further features and advantages will be more apparent from the following detailed description of a preferred, but not exclusive, embodiment for the forming and candy wrapping up machine according to the invention, shown by way of example in the accompanying drawings, in which:

FIG. 1 is a front perspective view schematically showing the outer assembly of the machine;

FIGS. 2, 3, 4 and 5 are perspective views showing upon different scales successive portions of the machine of FIG. 1, some portions thereof being broken away and/or cut away for a better illustration of the control kinematic means thereof;

FIG. 6 is a diagram showing the arrangement of the portions of the machine shown in FIGS. 2 through 5 in order to follow the motorization of the several operating members of the machine;

FIG. 7 is a perspective view showing the candy wrapping line in the so-called "tip type" of style;

FIG. 8 is an enlarged perspective view showing a detail of the wrapping line in FIG. 7; and

FIG. 9 is a graph showing the time vs. phase of the operative moving elements of the machine in a machine cycle.

Referring to the drawings, the stationary frame of the machine is shown at 1 and an electric motor forming the primary drive supply is shown at 2 (FIG. 4).

A pulley 3 is keyed on the shaft of motor 2 and causes a pulley 5 to rotate by means of a belt 4. On axis 6 of this pulley a gear wheel 7 and a diamond cam 8 are keyed. At opposite positions said cam is provided with a pair of small idle rollers 9 for cyclically and subsequently engaging within the radial slots of a Maltese-cross wheel 10. Through the connection provided by intermeshing wheels 11 and 12, said gear wheel 7 causes a gear wheel 13 fast with its shaft 14 and a gear wheel 15 fast with its shaft 16 to rotate (FIG. 5).

The ratio of gear wheels 11, 12, 13 and 15 to gear wheel 7 is in the order of 1 : 2, or the number of teeth for the former gear wheels is half the number of teeth for gear wheel 7. Thus, each revolution of shaft 6, and hence gear wheel 7, produces two revolutions for each of said gear wheels 11, 12, 13 and 15 and for corresponding shafts 14 and 16.

Since, as explained hereinafter, said shafts 14 and 16 are associated with members being operative for a respective operation on each articles or candy to be wrapped up, it will be stated at once that the time corresponding to a complete revolution of said shafts 14 and 16 is conventionally assumed as the machine cycle time, so that a machine cycle will thus correspond to a rotation through 360° of said shafts 14 and 16, as shown at the bottom of the graph in FIG. 9.

As mentioned, the uniformly rotating diamond cam 8, intermittently rotatably drives the Maltese-cross wheel 10, the axis 17 of which is also intermittently rotated. In the embodiment shown, this axis stops to rotate at each sixth portion of revolution, that is at each half revolution of gear wheel 7 and, accordingly, of shaft 6 and diamond cam 8, corresponding to a machine cycle, as previously noted.

A radial pliers wheel 18 is keyed on said axis or shaft 17 (FIGS. 1 and 4), so that this wheel 18 will similarly intermittently rotate, as shaft 17. In the embodiment shown in FIGS. 1, 4 and 7, said wheel is provided with six radial pliers, each of which comprise a stationary jaw 19*a* and a jaw 19*b* swinging about a pin 19*c* which is fixed to the hub of wheel 18, as explained hereinafter.

Beside meshing wheel 11, said wheel 7 meshes with a further gear wheel 20 provided with the same number of teeth and keyed on a shaft 21, thus being also uniformly rotated (FIGS. 2 and 4).

In turn, said wheel **20** (FIG. 2), by meshing with a wheel **22** having the same number of teeth and keyed on shaft **23**, causes the latter to be uniformly rotated. On said shaft **21** there are also keyed a diamond cam **24** and a gear wheel **25** which therefore rotate integrally with shaft **21**.

At its opposite ends cam **24** is provided with idle rollers **26** alternately engaging the radial slots of a Maltese-cross wheel **27** fast with its shaft **28** which is, therefore, intermittently rotated, and in turn through a gear **29** having half a number of teeth with respect to wheel **25**, said wheel **25** causes a shaft **30** to be uniformly rotated.

A wheel **31** is keyed on shaft **28** and is provided with radial sections **32**, each of which can accommodate a candy. Instead, shaft **30** carries, as keyed thereon, a cam **33** which at each revolution operates scissors **34** for cutting a candy from the continuous web, as better explained below.

Such scissors operate closely adjacent wheel **31**, by acting in a plane at right angles to the wheel axis, and comprise two jaws **34***a* pivoted on a common pin **34***b* and at one end provided with cutting edges **34***c*. Two pawls or idle rollers **34***d* are formed on said jaws **34***a* and are engaged within the groove of cam **33** keyed on said shaft **30**. A return spring **34***e* is inserted between said jaws **34***a*, tending to spread them apart so as to ensure the constant adhesion of rollers **34***d* to the active surface of the driving groove in cam **33**.

A channel **35** is defined by two parallel vertical walls (FIGS. 1 and 3). Through this channel the continuous web of plastic material is introduced and fed, and along its longitudinal direction the progressive roughing-out and formation of the continuous web is also accomplished, until a section is provided corresponding to the section of the candies.

Conventionally, the first stop station for section **32** of wheel **31** is defined as that station carrying each section **32** at the outlet of channel **35** (corresponding in FIGS. **1** and **2** to the position of the lowermost section **32**); the second stop station for sections **32** is defined as that station carrying the next sections to alignment with and at the pliers of wheel **18** (in FIGS. **1** and **2** this station is displaced counterclockwise by 90° with respect to the preceding station). Similarly, the first stop station for pliers **19** of wheel **13** is defined as that station carrying each individual pliers to stop in alignment with and at one section of wheel **31** at a stationary condition at the second station, while for the embodiment as shown the second stop station for said pliers is defined as the diametrically opposite position to the preceding one.

Channel **35** extends to open at the first stop station for sections **32**, so that the candies can be directly introduced into the same. At the opening, said channel has a loop **36** (FIG. **1**) of a larger cross-section, so as to act as an equalizing chamber.

The plastic web is progressively roughened out and shaped on its sides and at the bottom by said parallel walls of the channel and bottom thereof, and at the top by subsequent surfacing discs **37**, **38** and **39** overlying the top of said channel. Within the channel, feeding of the continuous web is operated by pairs of drawing rollers **40**, **41**; **42**, **43**; and **44**, **45**.

It should be noted that web feeding occurs by uniform motion along channel **35** and arrives at loop **36**. Feeding is intermittently effected starting from rollers **44**, **45**. For this purpose, pairs of rollers **40**, **41** and **42**, **43** uniformly rotate, whereas pairs of rollers **44**, **45** intermittently rotates. The movement to said pairs of rollers is imparted as follows : At the end of said uniformly rotating shaft **23** a gear wheel **46** (FIG. 3) is keyed and meshes with wheels **47** and **48** fast with respective shafts **49** and **50**. Two inclined-tooth gears **51** and **52** are secured on shaft **49**. A gear wheel **53**, fast with its vertical shaft **54** carrying at the top said drawing roller **40**, meshes with gear **51**. Similarly, gear **52** meshes with a gear wheel **55** fast with its shaft **56**, at the top of which drawing counter-roller **41** is keyed. Said surfacing disc **37** is also secured to the upper end of said shaft **56**. Thus, the two rollers **40** and **41** are made to uniformly oppositely rotate. Similarly, shaft **50** carries two inclined-tooth gears **57** and **58**.

Through its engagement with gear wheel **59**, gear **57** causes shaft **60** of the latter to rotate, said drawing roller **42** being keyed to the upper end of this shaft **60**. Through its engagement with wheel **61**, gear **58** causes shaft **62** of the latter to rotate solid therewith and carrying at the top said counter-roller **43** and said surfacing disc **38**. Thus, a uniform rotary motion is ensured for the pairs of oppositely rotating drawing rollers **40**, **41** and **42**, **43**, as well as said surfacing discs **37** and **38**.

Shaft **23** comprises two sections which can be functionally interconnected by a front tooth clutch, as seen in FIG. **3**, wherein the two semi-clutch elements **63** and **64** are coupled to each other.

Thus, the machine portion comprising said feed channel **35** for the continuous web, as well as said members for shaping this continuous web and relative control members, are assembled within a housing **65** pivoted about a vertical axis **66** to machine base **1**, so that it can be removed from the functional position of FIGS. **1** and **3** to allow for access to other machine members for maintenance, cleaning purposes, etc.

On this shaft **23** there is also keyed a gear wheel **67** meshing with a wheel **68** which causes its shaft **69** and diamond cam **70** fast therewith to uniformly rotate. At the opposite ends, said cam **70** is provided with idle rollers **71** engaging within the radial slots of a Maltese-cross **72** keyed on a shaft **73**, the latter carrying at its end an inclined-tooth gear **74** which rotates a gear wheel **75** fast with a shaft **76** transversely of said shaft **73**. Due to this kinematic connection, shaft **76** will thus intermittently rotate. Two inclined-tooth gears **77** and **78** are secured on said shaft **76** and fast therewith.

Gear **77**, by engaging with gear wheel **80** fast with vertical shaft **79**, causes the latter to intermittently rotate. Said surfacing disc **39** is secured above said intermittent drawing roller **45** which, in turn, is secured to the upper end of shaft **79**. In turn, gear **78** causes shaft **82** to intermittently rotate, drawing roller **44** being fast with said shaft **82** and, therefore, oppositely rotating with respect to said roller **45**.

In their intermittent rotary motion, said wheels **18** and **31**, comprising in this embodiment six pliers **19** and four sections **32**, respectively, and distributed at regular intervals from one another on the respective wheels, will move so that at each stop subsequent sections **32** of wheel **31**, at a stationary condition at the second station, and subsequent pliers **19** of wheel **18**, at a stationary condition at the first station, are aligned.

Therefore, between two subsequent stops, said wheel **31** travels through an arc of 90° in an anticlockwise direction, whereas wheel **18** travels through an arc of 60° in a clockwise direction.

The second station for wheel **31** and the first station for wheel **18** are connected by a guideway **83** (FIGS. **1**, **2** and **7**) defined by two overlying parallel surfaces and interrupted by a vertical slot **84**, through which and transversely of said guideway the supply is accomplished for subsequent lengths **85** (FIG. **7**) of wrapping material supplied, for example, by reels (not shown in the drawings), carried by reel shafts **86**. These lengths intermittently and stepwise with the arrival of subsequent candies will intersect said guideway, being carried thereto by known devices, schematically shown at **87** in FIG. **1**.

As cut by scissors **34**, the candies introduced into sections **32** subsequently presenting at the first station, when reaching the second station, are forced into said guideway **83** by a pushing element **88** associated with a stem **89** reciprocably driven by a connecting rod **90**, the head **90***a* of which is restrained to guide element **91** by idle roller **92** and the small end **90***b* of which is rotated by a disc **93** fast with shaft **94**. A gear wheel **95** is keyed on said shaft **94** and meshes with a gear wheel **96** keyed on said continuously rotating shaft **23** and having twice the number of teeth relative to said gear wheel **95**.

As mentioned, the jaws **19***b* for pliers **19** of wheel **18** are pivoted at **19***c* to said wheel hub and are driven to alternately swing. More particularly, they have to be stationary during movements of wheel **18**, so as to retain, with the co-operating jaws **19***b*,the candies being transferred thereto, and should spread apart from said co-operating jaws **19***b*, so as to open

said pliers at the first and second stop stations to allow for introducing the candies between said pliers and extracting them at transfer completion, respectively.

To this end, (see FIG. 5), each pin 19*c* of jaws 19*b* extends as an arm 97, carrying at one end an idle roller 98 slidable on a cam contour 99 keyed to the end of a cylindrical sleeve 100. A radial arm or link 101 is fast with the end of said sleeve 100, the end of a connecting rod 102 pivoting thereon, the small end of said connecting rod 102 slidably surrounding a cam 103 secured on said shaft 14. A further cam (not shown in FIG. 5) is secured on said shaft 14 and slidably surrounded by the small end 104*a* of a connected rod 104 which at its opposite end is pivoted to a link 105 fast with the end of a shaft 106 internally of said sleeve 100 and, at the opposite end emerging from said sleeve, carrying a radial arm 107 to which, so as to be at the end of pliers 19 at a stationary condition at the first stop station for wheel 18, there is secured a substantially vertically extending plate 108, this kinematic coupling making said plate 108 swingably move. The radial position for plate 108 can be adjusted, for example, by a screw 109 which is adjustably securable within a slot 110.

A third cam (also not shown in FIG. 5) and rotatable integrally with said shaft 14, causes a connecting rod 111 to alternately swing, the small end 111*a* of the connecting rod slidably surrounding said cam. Through a link 112, said connecting rod drives a shaft 113, so that the latter will swingably rotate. A fork element 114 (FIGS. 1, 5 and 7) is secured to the end of said shaft and, therefore oscillates in turn. Fork 114 is located along the passage zone for the candies retained by the pliers between the first and second stop stations therefor and straddles this passage zone, so as to involve those wrapping portions transversely from said pliers. At 115 (FIGS. 1, 4 and 7) a cylindrical profile is shown, said profile being tangential to the rotary path of the pliers at the area between the first and second stop stations, and at 116 (FIG. 1 and 7) a fixed bending element is shown as comprising two parallel plates located on either side of the pliers passage zone.

A guide element 117 horizontally extends in alignment with each of the jaws 19*a*, 19*b* of pliers 19, when the latter are at the second stop station, said guide element 117 being defined by two overlying surfaces parallel to each other, the lower surface 117*a* of which is flat and horizontal, whereas there opens on the upper surface 117*b* a vertical slot 118 slanting to the middle vertical plane of the pliers, and which, from a horizontal attitude at the top vertical distance from surface 117*a* and close to the pliers, takes on a progressively decreasing attitude, approaching said surface 117*a* as moving away from the pliers, i.e. to the location wherein the two surfaces are spaced apart by the length nearly corresponding to the candy width. This arrangement serves the purpose of progressively engaging, as explained hereinafter, the tips of the wrapping as projecting end upward, causing them to progressively bend over against the candy body. In the embodiment shown, only one helically extending slot 118 is provided, so that only one of the tips is bent over against the candy by this profile.

Withdrawal and forwarding for the candies as retained by the subsequent pliers, from the second stop station thereof and to guide element 117, are effected by an extractor 119 which is secured to the end of a rectilinear reciprocable stem 120 : this motion is imparted to stem 120 by a connecting rod 121, the end 121*a* of which is restrained by an idle roller 122 along a straight horizontal guide 123 and the small end 121*b* of which is pivoted on a disc 124 keyed on said shaft 16, so as to be uniformly rotated.

Thus, said extractor 119 urges the candies along guideway 117 as withdrawn from each of the rotating pliers, subsequently presenting at the second stop station, and hence retracts prior to arrival of the next pliers at said station.

The subsequent candies being forwarded along guideway 117 are placed on a table 125 and by a pusher 126 from there on a conveyor comprising a plurality of sections 127 fast with a chain 128 extending parallel to the forming line for the candy wrapping, winding about the sprocket wheels 129 and 130 (FIGS. 1, 5 and 7).

A fixed plate 125*a*,located just above the candies moving along table 125 to sections 127, is designed for bending over also the second tip of the wrapping against the candy body.

Feeding of chain 128 is by uniform continuous and nonintermittent motion. To this end, a gear wheel 131 is keyed on shaft 16, which gear wheel drives through an idle gear wheel 132 a gear wheel 133 keyed on shaft 134. A bevel gear 135 is also keyed on said shaft 134 and meshes with a bevel gear 136 keyed in turn on an end of shaft 137. Through shaft 138 and universal joints 139 and 140, this shaft 137 drives a shaft 141, on which a bevel gear 142 is keyed and meshes with a bevel gear 143 keyed on shaft 144 of sprocket wheel 130.

Reciprocating motion of pusher 126 is also derived by said shaft 16, a bevel gear 145 being keyed thereon for this purpose. Said bevel gear 145 meshes with a bevel gear 146 on the keying axis 147 of which a disc 148 is also keyed. Circumferentially to said disc 148 the small end 149*a* of a connecting rod 149 is pivoted, the other end 150 of which is guided by idle roller 151 along guideway 152 and carries, as articulated thereto, an end of rod 153, said pusher 126 being fast with the other end thereof.

The candies being placed on successive sections 127 and transferred by chain 128 should be at least partially sealed. For example, considering plasticized or waxed paper material for use as wrapping, what is needed is to effect a heat welding at the areas on the candy on which the tips are bent over. To this end, the candies pass below a thermally conductive plate 154 which is heated by any known means, such as heating elements, so that the wrapping will be heat welded at the area facing the plate. Since the candies are heated due to this operation, the heat welding area should be cooled. Therefore, also along the feeding line for sections 127, a sleeve 155 is located and supplied through an inlet connection 156 and an outlet connection 157 a continuous cool water circulation from a supply source, so that the candies on passing below said sleeve 155, are convection cooled.

The operation of the machine according to the invention will be described also referring to the graph of FIG. 9, wherein the time vs. phase are shown for the moving members in the course of a machine cycle, i.e. a revolution of cyclic shafts 14 and 16.

For members 72, 31, 88, 18, 114, 119 and 126, the thick full lines in this graph coincide with or are parallel to the respective thin base line, and indicate the time in degrees of the machine cycle, wherein said respective members are at dwell, and the inclined lines indicate the movement times, also in degrees, whereas for scissors member 34 the thick line coinciding with the thin base lines indicates the time in which the cutting edges 34*c* are at the open scissors position, i.e. spaced apart from each other, and the inclined lines indicate the closing and opening times for said scissors, respectively. For the wrapping material length 85, the thick line coinciding with the thin base line indicates the time in which the supply device rollers 87 act upon the precise utilizable length 85, and the parallel line indicates the time in which said supply rollers are inoperative between two next lengths, whereas for the other moving pliers members 19*b* the thick lines coinciding with and parallel to the respective thin base line indicate the times of closed and open pliers, respectively, and the inclined lines indicate the closing and opening time, respectively.

In the diagram, the graphic indications for the closing and opening of the moving pliers 19*b* are shown separated since, as more apparent hereinafter, the closing and opening for one pliers occurs at a distance of some cycles, such as in the particular embodiment shown, which cycles are spaced apart by two closed pliers cycles between a closing cycle and an opening cycle, respectively.

From this graph it is therefore apparent that for a 360° revolution of cyclic shafts 14 and 16, a translational movement and dwell, respectively through 180°, will occur for the continuous plastics material web, so as to allow scissors 34, during dwell step, to provide for opening and closing movements thereof in order to cut the candies from the continuous web.

A further significant feature clearly displaced by the graph is that relating to the movement and dwell times, respectively, for the two wheels **31** and **18**, which for wheel **31**, are designed to meet the requirements of conveniently introducing the continuous web length for candy cutting and, respectively, the reciprocating motion of pusher **88** for transferring said previously cut candies and, for wheel **18**, the requirement relating to candy transfer between the pliers thereof and wrapping up operation, respectively, as will be seen in the following.

Thus, for each machine cycle it appears that wheel **31** has 180° movement time and 180° dwell time, whereas the movement and dwell times for wheel **18** are 120° and 240°, respectively.

The graphic lines for the other members, as shown in the diagram, are also readily indicative for the functions of such members.

Therefore, this operation is as follows :

The continuous plastics material web is introduced into channel **35**, wherein the drawing effect of the pairs of rollers **40, 41**, and **42, 43** causes it to advance by uniform motion. At the same time, the surfacing discs **37** and **38**, as well as the bottom and vertical walls of said channel **35**, impart to the web a cross-section progressively approaching and merging into that of the candies to be wrapped. Beyond the major section loop **36**, the continuous web is, instead, intermittently drawn by the pair of rollers **44, 45**, while disc **39** terminates the surfacing operation. Therefore, it is apparent that by properly and interdependently selecting the rotational rates for the drawing rollers by uniform motion and for the drawing rollers by intermittent motion, the drawing web speed by the intermittently rotating rollers can be considered as varying about an average value coincident with the continuous feeding speed of the web. The major section loop **36** is just a kind of compensation chamber for intermittently storing, in timed relationship with the intermittent rotation of rollers **44** and **45**, the material excess accumulated at each half period and removed at the next half period. As a result, the web mass intermittently advances beyond rollers **44** and **45** and in timed relationship with this advance, the cutting edges **34***c* of scissors **34** will cut subsequent candies C from the web.

The mass rearwardly of the cut candies will urge the latter into that one of sections **32** which is at the first stop station of wheel **31**.

The travel of an individual candy along all of the subsequent steps leading to the candy wrapping will now be followed. It is to be understood that the next candies are subjected to the same set of operations, each candy moving on as out of phase by one step with respect to the preceding one.

When introduced into the section **32** which is stationary at the first stop station, wheel **31** rotates through 90°, so as to transfer the candy C TO THE second stop station, at the inlet of guideway **83**. As a result, a new section **32** has moved of course to the outlet of channel **35** to receive a next candy. Thus, the candy is forwarded by pusher arm **88** within said guideway **83** and advances therealong. On advancing (FIG. **7**), the path of the candy intersects a wrapping material length **85**, such as paraffined or plasticized paper, previously arranged in timed relationship with the progress of successive candies through the guideway **83** at slot **84**. On advancing, the candy forwardly draws said length of wrapping material which, therefore, is pushed into the groove of guideway **83** in a U-shaped configuration with its edges **85***a*, **85***b* bent rearwardly by the surfaces defining said guideway and said groove or slot **84** as well, as seen in said FIG. **7**. Finally, the candy arrives at pliers **19** which is stationary at the first stop station of wheel **18**. At this location, jaw **19***b* is spread apart by jaw **19***a*, so as to aid the candy introduction. As controlled by cam **99**, said jaw **19***b* closes again, thus retaining the candy.

Then, wheel **18** will start to rotate and due to this motion the wrapping edge **85***a* projecting from the candy is bent over by the inlet edge of profile **115** against the outer side of the body of the candy. Thus, the wrapping takes on a first prismatic tubular configuration.

By being tangential to the path of the side of the candy, the cylindrical profile **115** will retain said bent-over edge against said outer side.

Candy transfer from the first station to the second station is effected by some intermediate dwells corresponding to the stop steps of the successive pliers alternating at the first station to receive the successive candies.

Fork **114** operates at one of these intermediate dwells. As the candy passes, this fork is driven by the control cam of connecting rod **111** to swing, so as to engage a face **85***c* of the prismatic wrapping on either side of the candy and to bend the end areas thereof against the sides of the candy parallel to the wheel plane. Then, fork **114** retracts and the candy passes, upon continued rotational movement of wheel **18**, between the two parallel plates **116** which bend over the projecting end areas **85***d*, **85***e* of the wrapping on either side of the candy in a direction opposite to feeding direction. Thus, a wrapping is achieved in which are defined two bent over upward projected areas **85***d*, **85***e*, arranged on either side of the candy and parallel to each other, as well as perpendicular to the candy body.

Finally, the pliers arrive at the second stop station, where jaw **19***b* controlled by cam **99**, opens to allow for candy removal.

This removal is accomplished by extractor **119** which forwards the candy within the guideway **117**, and slides the candy along the flat surface **117a**. As the candy enters this guideway **117**, the end section **85***f* of edge **85***a* is bent over by the leading edge of surface **117***b* and overlies the previously bent over edge **85***b*.

Thus, two "tips or pins" are provided, whereby as the candy advances between the two surfaces **117***a*, **117***b* and owing to slit **118** opening on surface **117***b*, one of the wrapping tips or pins, such as **85***g*, is progressively bent over against the candy body. Finally, the latter is placed on table **125** and by pusher **126** on that of sections **127** which, by advancing in a continuous motion, is aligned with said table **125**, and is forwarded to the final cycle stations. Upon moving, the candy passes tangentially below said plate **125***a* where the second tip or pin **85***h* is also bent over against the candy body. Finally, heat welding of the upper wrapping portion is carried out by plate **154**, as well as the subsequent cooling of the heat welding area by passing below the cooling sleeve **155**. At the end of the chain extension, the wrapped candies emerge from the machine.

In practice, it has been found that the machine according to the invention for forming and wrapping up candies from a continuous web of streaming confectionery, or similar plastics material, does attain the predetermined objects.

Thus, the structure of this machine is substantially compact, the operative path for the candies along the sequence of processing steps is particularly simple and rational, the operative members are minimized, and the moving masses are so designed as to ensure a machine operation at high speeds, and hence with a very high candy output.

The invention, as particularly described is liable to many modifications and variations.

For example, it is possible to omit the plate **125***a* for bending the second wrapping "tip or pin" **85***h*, by using a guideway **117** a second slit **118** symmetrically mirror-like extending with respect to the candy center line, so that each of the longitudinally symmetrical portions forming the surface **117***b* will overlie the passage area for one of the tips or pins **85***g*, **85***h* engaging and bending over the respective tip or pin. Also shaft **14** may have a further cam **158** swingably driving a connecting rod **159**, the small end **159***a* of which encloses said cam : this connecting rod will be adapted to control the clearance of known members, such as, according to the above mentioned Italian Pat. No. 466,665, the member for bending the wrapping as a simple or double "knot," in combination with said bending member **108**; obviously, in accordance with the type of packing as desired to be obtained, either connecting rod **111**, or connecting rod **159** will alternatively operate, which alternative can be almost immediately selected by a simple and ready adaptation.

Finally, all of the operative parts can be replaced by other technically equivalent elements.

I claim:

1. A machine for forming and wrapping up individual articles with a so-called "tip or pin" type wrapping comprising: means for forming articles from a continuous plastic material web; an intermittently rotating radial section wheel for transferring said articles from a first stop station for successive sections to a second stop station for said sections; means for inserting said articles in said sections of said radial wheel at said first stop station; a transfer guideway extending from said second station and defined by two parallel facing surfaces; means for intermittently feeding successive lengths of wrapping material transversely intersecting said guideway; a wrapping wheel having a plurality of gripping pliers radially extending therefrom; means for intermittentily rotating said wrapping wheel; pusher means for transferring successive articles and related lengths of wrapping material engaged and urged by the respective articles along said guideway and between said surfaces from said second station to one of the gripping pliers of said intermittently rotating radial pliers so that each length of wrapping material along the guideway is substantially bent over in a U-shape about the respective article; and bending member means mounted adjacent said wrapping up wheel for bending the lengths of wrapping material for successive articles about said articles upon rotation of said wrapping wheel; and wherein said bending member means comprise a bending device which is fixed tangential to and surrounding the circular transfer path of the article to clinch one of the edges of the U-shaped length of wrapping material on the outer side of the article relative to said wrapping wheel; a substantially fork-like bending device, swingably straddling said pliers wheel for bending the end areas of a wrapping face against the heads of the articles perpendicular to said side; a fixed bending device substantially comprising two plates parallel to the faces of said pliers wheel and located adjacent and on either side thereof for bending over at right angles, in the manner of tips or pins parallel to one another, the wrapping ends during rotational movement of said pliers wheel; a bending surface guideway for clinching the end section of said edge on the next face of the article, thus terminating said tip or pin bending, and comprising a bending surface, gradually curving in the article feeding direction, for engaging said progressively bending over at least one of said tips or pins on the article; and ejector means for forwarding the successive articles from said pliers along said bending surface to the machine outlet.

2. A machine according to claim 1, wherein said section wheel, transfer guideway, wrapping wheel, and bending surface guideway, extend in a rectilinear direction transversely of the direction in which the articles are inserted into said section wheel, and further comprising conveyor means for receiving said articles in a wrapped condition from said bending surface guideway, said conveyor means being disposed parallel to said rectilinear direction.

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