March 7, 1972 H. C. LINGLE ET AL 3,647,593

METHOD OF AND APPARATUS FOR PRODUCING UNIFORM LENGTHS OF RIBBON-CONNECTED FASTENER CLIPS

Filed Dec. 1, 1969 2 Sheets-Sheet 1

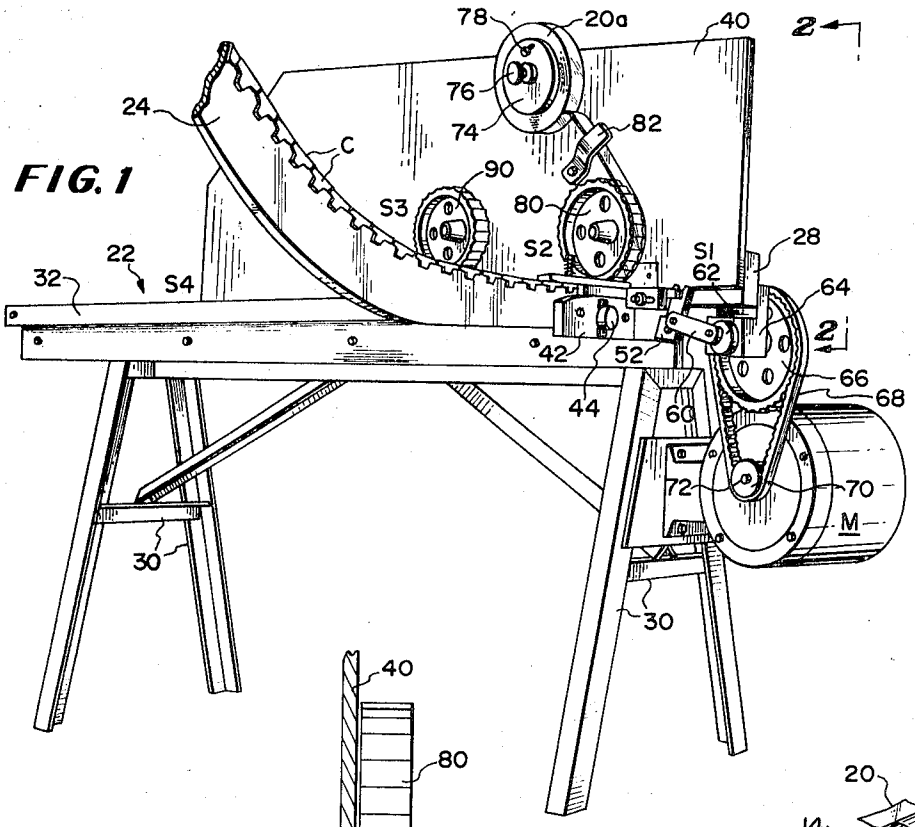

FIG. 1

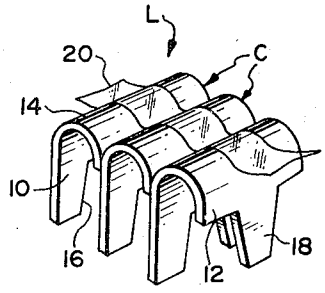

FIG. 1A

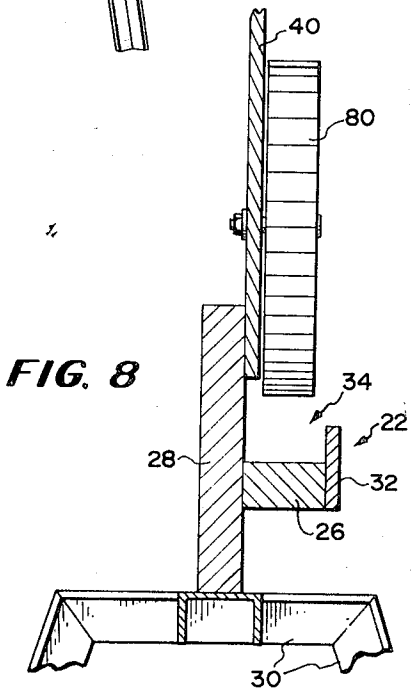

FIG. 8

FIG. 2

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METHOD OF AND APPARATUS FOR PRODUCING UNIFORM LENGTHS OF RIBBON-CONNECTED FASTENER CLIPS

Filed Dec. 1, 1969 2 Sheets-Sheet 2

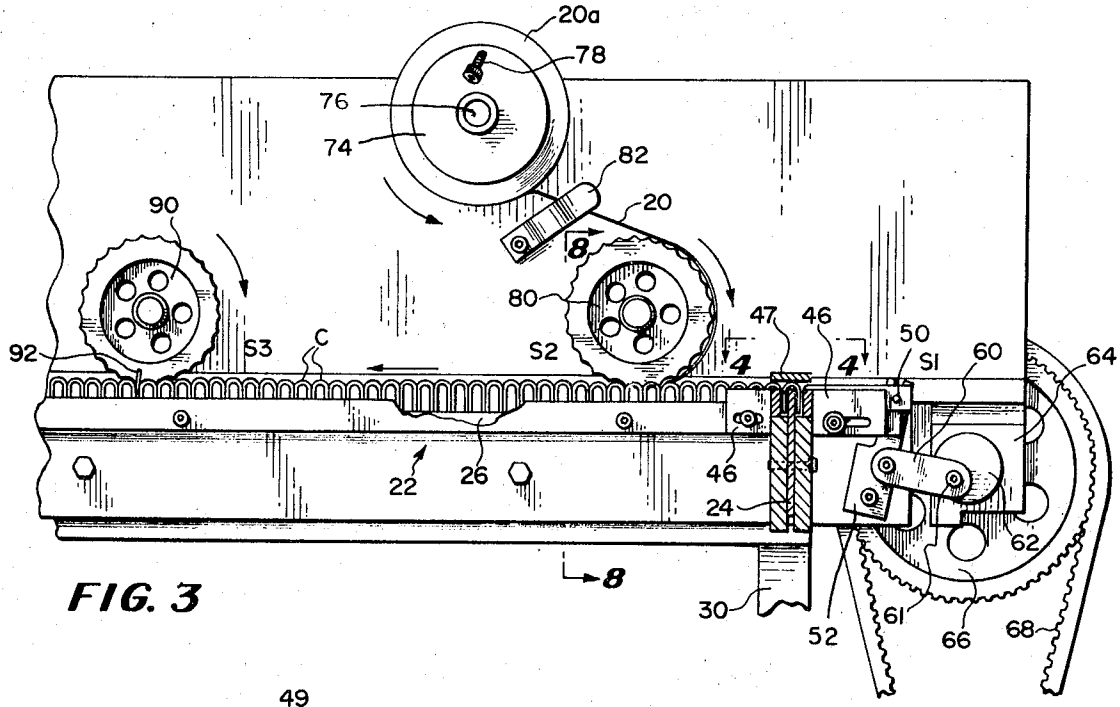

FIG. 3

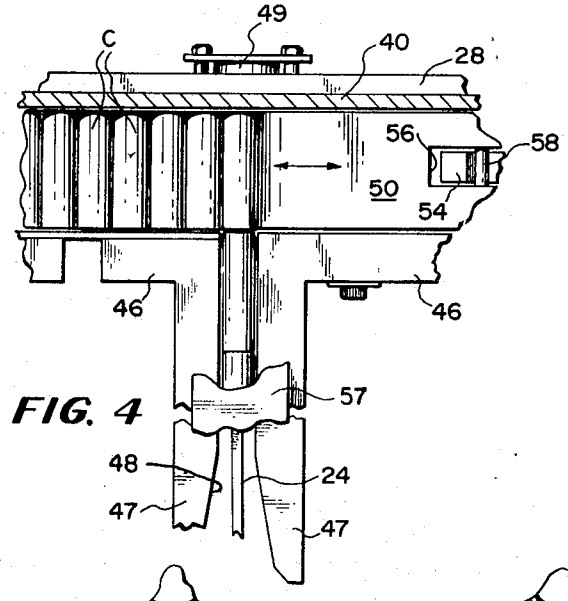

FIG. 4

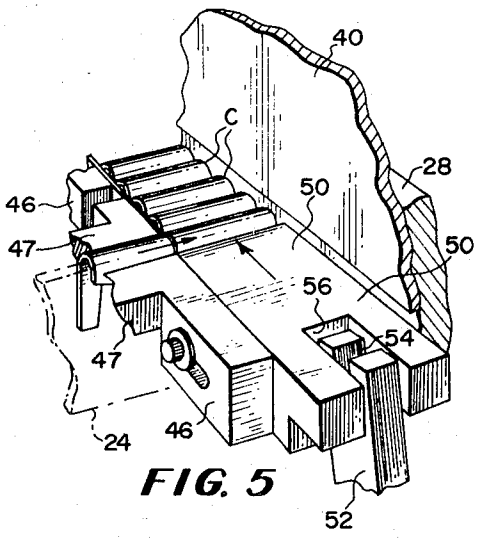

FIG. 5

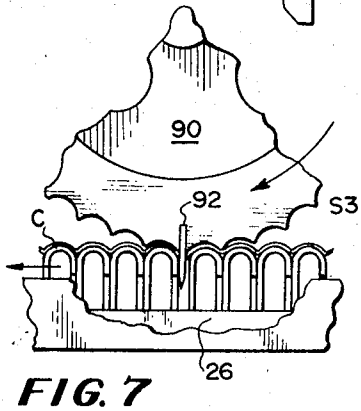

FIG. 7

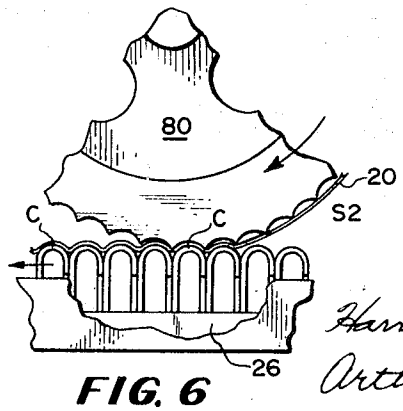

FIG. 6

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METHOD OF AND APPARATUS FOR PRODUCING UNIFORM LENGTHS OF RIBBON-CONNECTED FASTENER CLIPS

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Int. Cl. B32b 31/10; B65d 83/08
U.S. Cl. 156—300 4 Claims

ABSTRACT OF THE DISCLOSURE

A method and fully automatic collating apparatus for producing uniform lengths of preformed, U-shaped, ribbon-connected fastener clips, such lengths being suitable for loading into the magazine of a clip-clinching tool. The disclosed exemplary apparatus for practicing the method embodies a clip-receiving and stacking station to which successive clips are fed in endwise fashion, at which they are arranged in side-by-side contiguity, and from which they are fed in a continuous stack to a ribbon-applying station. At the ribbon-applying station a rotatable transfer wheel impresses a continuous ribbon upon the crown portions of the clips and the thus connected continuous string of clips advances to a severing station where predetermined lengths of the ribbon-connected clips are severed and further impelled to a discharge station.

The improved method and apparatus comprising the present invention has been designed primarily for use in connection with the production of uniform lengths of U-shaped, sheet metal, ribbon-connected fastener clips which are suitable for packaging in boxes for shipment, and in which the individual lengths are designed for unit-loading into the magazine of a portable clip-clinching tool by means of which the clips are applied to two or more adjacent wires, rods or the like for securing the same together. An exemplary form of such a U-shaped clip, in association with similar clips in ribbon-connected form, is disclosed in our copending U.S. application, Ser. No. 854,037, filed Aug. 29, 1969, and entitled "U-clip Assembly." An exemplary form of a portable pneumatically operable tool for applying such a clip is disclosed in our U.S. application, Ser. No. 870,469, filed Oct. 21, 1969, and entitled "Portable Clip-clinching Tool." The invention however is not to be limited to use in connection with such fastener clips and, if desired, the principles thereof may, with or without modification as required, be applied to the production of a wide variety of ribbon-connected articles such as nails, screws, staples and similar fasteners. Irrespective however of the particular use to which the invention may be put, the essential features thereof are at all times preserved.

The invention is specifically concerned with a method and clip-collating apparatus for producing lengths of ribbon-connected clips such as have been shown in the above-mentioned copending application, Ser. No. 854,037 wherein a row of contiguous U-shaped clips having curved crown portions and depending parallel side legs slightly angled to the crown portions are disposed in side-by-side relationship with their adjacent side legs abutting each other in face-to-face relationship, and wherein a carrier strip or ribbon is adhered substantially coextensively to such crown portions and is forced downwardly into the troughs which exist at the juncture regions between adjacent clips in the generally cycloidal surface presented collectively by such crown portions.

The advantages of such a length of ribbon-connected clips have been fully set forth in the above-mentioned copending application, Ser. No. 854,037 and reference may

be had thereto for a full understanding of such advantages. However, for purposes of description herein, it is deemed sufficient to state that by bonding the entire crown portions of the clips to the carrier ribbon instead of merely applying the ribbon tangentially thereto, greater strength of the assembled length of clips is attained while, at the same time, a unidirectional hinge action is attained which enables the clips to be loaded in a curved magazine with ease and subjected to forces within the magazine during use of the clip-clinching tool which hold the clips in firm contiguity for accurate presentation of the clips to the clip-clinching jaws of the tool, thus reducing the chance of improper ribbon rupture and consequent jamming of the tool.

In carrying out the invention, the preformed clips are conducted in endwise fashion along a linear path from a remote forming station and are deposited on a stacking table at the receiving end thereof and at a stacking station where an arrangement of stacking instrumentalities functions to displace each clip laterally immediately upon arrival at the stacking station so that it impels the preceding clip forwardly along the stacking table, thereby building up a forwardly progressing stack of the clips. As the stack advances, it passes in tangential fashion beneath a ribbon-applying transfer wheel, the periphery of which is of gear-like configuration and presents a surface having a hypocycloidal contour so that it effects mating engagement with the cycloidal surface presented by the adjacent crown portions of the stacked clips which pass therebeneath. As the stacked clips pass beneath the transfer wheel, the apex regions of the gear-like periphery of the wheel enter the trough portions between adjacent crown portions of the clips so that the wheel derives its rotary motion by reason of its tangential disposition with respect to the advancing stack, somewhat in the manner of a rack and pinion drive, this motion serving to draw a length of ribbon, which preferably is of a pressure sensitive type, from a roll of such ribbon and applied it to the crown portions of the clips in the stack as the latter passes beneath the wheel. The ribbon extends around a major circle sector of the transfer wheel and is directed toward the region of tangency where it is securely gripped between the wheel and the advancing stack and is thus forcibly drawn from the roll. The apices of the hypocloidal periphery of the transfer wheel "tuck" the ribbon, so to speak, deep into the troughs and, in so doing, they cause the ribbon to become stretched and thus wrapped over the crown portions so that the entire crown area of the stack, in the longitudinal direction of the latter, is intimately covered by the ribbon.

The thus connected strip or string of clips may then be coiled to any desired diameter and the clip-clinching tool fed from the coil or, if desired, the stack which now is ribbon-connected, may be further advanced along the stacking table to a severing station where it passes beneath a rotatable cutter wheel which also has a hypocycloidal contour so that it derives its motion from the ribbon-covered stack. One or more cutter blades carried by the cutter wheel periodically enters the trough regions between adjacent clips, thus effecting a severing operation each time a cutter blade engages the stack. The severed lengths may be immediately and manually drawn from the stacking table or, alternatively, they may be impelled by the stack to a discharge station where they may be removed from the stacking by gravity or by automatic handling apparatus.

The provision of a clip-handling and treating apparatus such as has briefly been outlined above constitutes the principal object of the present invention.

High speed of operation, visibility of practically all moving parts and of the clips undergoing treatment during machine operation, accessibility of such parts and of the

clips so that remedial minor adjustments may be made without stopping the apparatus, and simplicity of construction so that the apparatus may be attended to without requiring skilled labor, are further advantageous features of the present invention. Other objects and advantages of the invention will become readily apparent as the following description ensues.

In the accompanying two sheets of drawings forming a part of this specification, one exemplary form of the invention has been shown.

In these drawings:

FIG. 1 is a front perspective view of a clip collecting machine embodying the present invention and showing the same operation;

FIG. 1A is a fragmentary perspective view of a length of ribbon-connected clips which has been assembled according to the present method and apparatus;

FIG. 2 is an enlarged end view of the structure shown in FIG. 1, the base framework, motor drive, and other portions of the apparatus being omitted in the interest of clarity;

FIG. 3 is a sectional view taken substantially on the line 3—3 of FIG. 2;

FIG. 4 is an enlarged fragmentary sectional view taken substantially on the line 4—4 of FIG. 3;

FIG. 5 is a perspective view of the structure shown in FIG. 4;

FIG. 6 is an enlarged fragmentary front view of a transfer wheel employed in connection with the invention and showing the same in operation upon a stack of clips which are passing therebeneath;

FIG. 7 is a plan view, similar to FIG. 6, of a cutter wheel and showing the same in ribbon-severing relationship; and

FIG. 8 is an enlarged sectional view taken substantially on the line 8—8 of FIG. 3, the clips being removed in the interest of clarity.

Referring now to the drawings in detail and in particular to FIG. 1A, there is illustrated a fragmentary portion of a length L of ribbon-connected clips C and which is capable of being produced en masse by the method and apparatus of the present invention. Such length is specifically designed for loading into the magazine of a portable clip-clinching tool of the general type shown and described in our aforementioned copending application, Ser. No. 870,469. If desired, the length L may be produced continuously by the present apparatus, in which case it may be discharged from the apparatus to a suitable coiling mechanism where it is caused to assume the form of an involute coil of the ribbon-connected clips. Alternatively, it may be periodically severed into individual sections of uniform length, each section containing a predetermined number of clips, in which case the apparatus is provided with ribbon-severing mechanism for this purpose as will be described in detail presently. The individual clips C are of conventional construction and each clip is in the form of a U-shaped sheet metal stamping having depending side legs **10** and **12**, and an interconnecting bight or crown portion **14** of generally semi-cylindrical configuration. The leg **10** is provided with a V-shaped recess **16**, while the leg **12** is provided with a conformably shaped tongue **18**, such recess and tongue assuming an interfitting relationship when the clip is clinched about a pair of wires or other objects to be secured together, all in a manner well-known in the art. In assembled length L, the clips C are stacked in side-by-side contiguity so that adjacent crown portions **14**, considered collectively, establish an upwardly facing undulatory surface having a generally cycloidal configuration. The various slips C are connected together by an elongated ribbon **20** which preferably is in the form of a continuous length of pressure-sensitive tape and which is firmly pressed onto the various crown portions **14** in coextensive relation and which is forced deep into the trough regions which exist between adjacent crown portions. As will be described in greater detail subsequently, an important feature of the present invention resides in the manner in which the ribbon **20** is caused to enter such trough regions and become adhered to adjacent clips so that a hinge action is set up between adjacent clips with practically no lost motion in such connection whereby clip separation during handling of the clip lengths is reduced to a minimum.

Referring now to FIGS. 1 to 3 inclusive, wherein an exemplary apparatus capable of practicing the present method is shown, the apparatus comprises a framework including an elongated, horizontally disposed, narrow charge table **22** along which the clips C are adapted to be impelled in stacked relationship from a clip-receiving and stacking station S1, through a ribbon-applying station S2, and a ribbon-severing station S3, to a discharge station S4. The supply clips C are adapted to be conducted to the clip-receiving and stacking station S1 on a conveyor rail **24**.

The charge table **22** is comprised of an elongated stacking rail **26** (FIGS. 3, 6, 7 and 8) along which the clips C are adapted to travel, the rail being secured to the front side of a central supporting bar or back plate **28** which is mounted on a supporting framework or leg structure **30**. A guide plate **32** is secured to the forward edge of the stacking rail **26** and, in combination with the supporting bar or back plate **28**, defines an upwardly facing channel-like guide path **34** for the clips traveling on the stacking rail **26**. As will become apparent presently, the bar **28** constitutes a back stop against which the clips C issuing from the conveyor rail **24** impinge as they arrive at the stacking station **51**.

A vertically disposed rectangular mounting plate or panel **40** which constitutes an upward extension of the back plate is secured to the front side of the supporting bar **28** and projects upwardly therefrom an appreciable distance. The mounting plate **40** serves to support the ribbon-applying and ribbon-cutting instrumentalities which are disposed at the operating stations S2 and S3 respectively, all in a manner and for a purpose that will be made clear presently.

The conveyor rail **24** by means of which the supply clips are fed to the stacking station S1 is in the form of an elonagted heavy gauge sheet metal member, the general plane of which extends vertically and which has its proximate end region extending substantially horizontally into the stacking station S1 as shown in FIGS. 1 and 2 and is secured to an attachment plate **42** which, in turn, is supported in any suitable manner from the supporting leg structure **30**. The supply clips C are freely slidable on the conveyor rail **24** and, accordingly, the side legs **10** and **12** thereof straddle the rail while the crown portions **14** rest on the upper edge of the rail in saddle fashion. The remote regions of the conveyor rail **24** arch upwardly as shown at the left hand side of FIG. 2 so that the clips may descend on this arched portion of the rail under the influence of gravity and thus impel the clips which rest upon the horizontal portion of the rail forwardly and into the stacking station S1. To assist such forward movement of the clips, a conventional unidirectional vibrating impeller **44** may, if desired, be applied to the rail **24** at an appropriate location, for example, by bolting the same to the attachment plate **42**.

As best seen in FIGS. 2, 4, and 5, a pair of L-shaped guide members **46** are adjustably secured to the stacking rail **26** on opposite sides of the conveyor rail **24** and are provided with laterally projecting guide fingers **47** which define a V-shaped throat **48** therebetween for entry of successive clips C into the stacking station S1. The elevated end of the conveyor rail **24** constitutes the receiving end thereof and, if desired, it may be operatively associated with the delivery end of a suitable punch press or the like (not shown) wherein the clips issue directly from the stamping operation and assume their saddle-like disposition on the rail **24**.

Considering now the stacking instrumentalities which are disposed at the stacking station S1, and referring par-

ticularly to FIGS. 3, 4 and 5, the leading clips which issue from the conveyor rail **24** enter the stacking station endwise, successively and one at a time. The effective level of the forward end of the conveyor rail **24** is such that each leading clip C is delivered to the stacking station slightly above the level of the upper surface of the stacking rail **26** so that such clip will slide forwardly and endwise off of the conveyor rail, abut endwise against the supporting bar **28** as clearly shown in FIGS. 4 and 5, and fall to an upright sidewise "standing" position on the upper surface of the stacking rail **26**. The clip will thus assume an initial position at the receiving end of the previously mentioned guide path **34** (FIG. 8). In order to prevent rearward reaction movement of each clip due to impact force as it strikes the supporting bar **28**, a magnet **49** is secured to the opposite side face of the bar **28**, thus magnetizing the bar in the immediate vicinity of the stacking station S1 and giving a dead blow impact to the clips C. A swinging cover strip **57** overlies the upper edge of the conveyor rail **24**, is held in position by a spring **59** and is capable of being swung to an out-of-the-way position to permit manipulation of the clips C in the vicinity of the stacking station in the event that jamming of the clips takes place in such region.

Immediately after a clip C is deposited on the stacking rail **26** of the charge table **22**, the clip is displaced sidewise and forwardly along the guide path which is established by the charge table. Such displacement is effected by means of a reciprocable actuator or plunger **50** (FIGS. 3, 4 and 5). the forward end region of the plunger overlying the stacking rail **26** and being guided in its reciprocal movements by one of the L-shaped members **46** on one side and by the supporting bar **28** on the other side. The plunger **50** is in the form of a slide block and, in its advanced position, it projects forwardly along the guide path **34** and overhangs the general plane of the conveyor rail **26** by a distance slightly greater than, or at least equal to, the width of a clip C so that the leading clip which is deposited in the stacking station on the rail **26** is thus pushed out of the path of movement of the next succeeding oncoming clip. In its retracted position, the plunger or slide block **50** is restored to a position wherein it clears such oncoming clip and allows the same to move onto the stacking rail **26**. During the next succeeding stroke of the slide block **50**, the last deposited clip will similarly be displaced forwardly along the stacking rail, thus pushing the first deposited clip forwardly so that the two clips assume a stacked side-by-side relationship. Continued reciprocation of the slide block **50** thus progressively increases the number of clips contained in the stack and the latter contiunes to advance bodily forwardly as a unit toward the ribbon-applying station S2.

Various means may be provided for reciprocating the plunger or slide member **50**, the exemplary means illustrated herein comprsing an oscillatable rocker arm **52** (FIGS. 1 to 5 inclusive), the lower end of which is pivotally secured to the supporting bar **28** and the upper end of which is bifurcated as indicated at **54**. The rear end of the guide block **50** is also bifurcated as indicated at **56**, the bifurcated end of a the rocker arm entering the bifurcations of the slide block and straddling a cross pin **58** (FIG. 4) carried by this latter end. Oscillation of the rocker arm **52** is effected by means of a link **60** (FIGS. 1 and 3) which is connected to an eccentric crank pin **61** on a rotary stub shaft **62**, the latter being journalled in a bearing block **64** which is suitably suspended from the lower edge region of the mounting panel **40**. The stub shaft **62** has mounted thereon a driven pulley **66** which is connected by a belt **68** to a driving pulley **70** carried on the drive shaft **72** of an electric motor M fixedly mounted on the supporting framework structure **30**.

Referring now to FIGS. 3 and 6 wherein the ribbon-applying instrumentalities by means of which the flexible ribbon **20** is applied to the crown portions **14** of the clips C during passage of the progressively established stack of clips as it advances through the ribbon-applying station S2, means are provided for removably supporting a roll of the adhesive ribbon or tape **20** on the mounting panel **40**, such means comprising a rotatable roll-supporting mandrel **74** which is mounted on a hub **76** for telescopic reception thereover of a commercially available roll of the ribbon. A locking set screw **78** enables the roll to be secured in position on the mandrel. Various forms of ribbon are suitable for use in connection with the present invention, the preferred form being any one of several pressure-sensitive tapes which are supplied in roll form and which may be transparent, translucent or opaque. Actual application of the ribbon to the crown portions **14** of the clips C is effected by means of a transfer wheel **80** which is rotatably mounted on the panel **40** at the ribbon-applying station S2 immediately above the guide path **34** for the clips C and which is so positioned that its periphery assumes a generally tangential relationship with respect to the crown portions **14** of the clips in the stack of clips passing therebeneath.

It is to be observed at this point that the crown portions **14** of the closely nested clips C in the stack establish a substantially continuous horizontally disposed generally cycloidal area. The periphery of the transfer wheel **80** presents a peripheral surface which is generally of a hypocycloidal nature, the amplitude of the arches in both cases being substantially the same. The hypocycloidal contour of the transfer wheel **80** is designed for mating cooperation with the cycloidal contour of the crown portions of the clips C in the stack, the transfer wheel **80** deriving its motion from the stack as the latter passes tangentially beneath the wheel. The ribbon **20** which issues from the roll **20***a* passes around a major circle sector of the transfer wheel **80** and then enters between the latter wheel and the crown portions **14** of the stack with its adhesive side facing such crown portions. Thus, as the stack of clips advances forwardly on the stacking rail **26**, the ribbon is securely gripped between the stack and the wheel and thus placed under the adhesive release tension of the roll **20***a*. A guide clip or finger **82** carried on the panel **40** constitutes an edge guide for the ribbon as it progresses from the roll **20***a* to the transfer wheel **80**. Because of the effective pressure exerted by the transfer wheel **80** against the crown portions of the clips C, and because the apices of the hypocycloidal curve presented by the periphery of the transfer wheel **80**, the ribbon **20** is forced into intimate contact with the crown portions **14** of the clips and these apex regions or edges force the ribbon deep into the trough portions which exist between adjacent clips so that as the stack of clips emerges from the ribbon-applying station S2, the ribbon **20** coextensively covers the crown portions along a band commensurate with the width of the ribbon. The clips C are thus maintained in their closely nested relationship so that their crown portions will not separate during handling or during their treatment when in the magazine of a clip-clinching tool. It is to be noted that while the crown portions **14** of the clips are held in substantial edge-to-edge contiguity, the adjacent legs of adjacent clips are free to separate slightly under the influence of unidirectional bending of a given length of interconnected clips. Bending forces which may be applied to the length of clips in the other direction result in a rigidifying of the length, thus rendering the length capable of ease of handling during insertion of the length into the magazine of a tool. Furthermore, because of such unidirectional bending the length of connected clips will conform to the curvature of a curved magazine and, by reason of certain arch deflection phenomena described in connection with our copending application, Ser. No. 870,469, maintain the length firmly seated on the bottom wall of the magazine.

The continuous stack of ribbon-connected clips C which issues from the ribbon-applying station S2 may be al-

lowed to accumulate to appreciable lengths as, for example, to a length embodying a thousand or more clips. In such an instance, due to the unidirectional bending ability of the length, it may be coiled in involute fashion and packaged as a coil for subsequent use in a tool magazine. However, in order to produce relatively short uniform lengths of ribbon-connected clips suitable for unit loading into a magazine, the ribbon-severing instrumentalities associated with the severing station S3 may be employed.

Accordingly, and as best shown in FIGS. 1, 3 and 7, a cutter wheel **90** which is similar to the transfer wheel **80** and which like-wise is provided with a generally hypocycloidal periphery, is rotatably mounted on the panel **40**. The periphery of the wheel **90** cooperates with the ribbon-covered crown portions of the clips in the stack or length of interconnected clips passing therebeneath in substantially the same manner as does the periphery of the transfer wheel **80**, the cutter wheel **90** thus deriving its motion from the linear progression of the stack of clips along the stacking rail **26**. However, during each complete rotation of the cutter wheel **90**, a cutter blade **92** (FIG. 7) enters between adjacent clips C and severs the interconnecting length of ribbon **20**, thus severing or detaching the leading region of the stack, which previously has underrun the wheel **90**, from the ribbon-connected clips which have not yet effectively engaged the wheel. The cutter blade **92** is preferably mounted on the wheel **90** so that it extends radially through one of the apex regions of the hypocycloidal surface thereof.

From the above description it will be obvious that the number of clips contained in any given length of ribbon-connected clips will be a function of the diameter of the cutter wheel or, more particularly, of the number of hypocycloid arches in the periphery of such wheel.

After the ribbon severing operation has taken place, the severed length of clips may be withdrawn by pulling it from its position on the stacking rail **26**. However, in the illustrated form, the stack is allowed to progress along the stacking rail to a region of discharge, i.e. the discharge station S4, which is located a distance from the severing station S3 equal to approximately the length of the severed ribbon-connected clips.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification since various changes in the details of construction may be resorted to without departing from the spirit of the invention. For example, whereas the cutter wheel **90** is described as being provided with a single cutter blade **92**, plural blades may be employed and mounted on the wheel in equally spaced relationship if desired. Furthermore, precisely mating cycloidal and hypocycloidal surfaces on the intermittently advancing crown portions of the clips C of the stack of clips and on the transfer wheel **80** respectively are not essential to adequate adhesion between the ribbon and the clips. Various star shape configurations for the transfer wheel are suitable, it being a prerequisite however for effective joining of adjacent clips that the transfer wheel be provided with finger-like projections which "tuck" the ribbon **20** deep into the troughs or voids which are established between adjacent clips in the stack.

What is claimed is:

1. The method of producing flexing predetermined lengths of contiguous U-shaped clips of sheet metal having curved crown portions in side-by-side relationship compositely defining an undulatory surface area and with conformed opposing legs of each clip having depending tongues symmetrically arranged to interfit and disposed parallel and slightly angled to the crown portion with the tongues of contiguous legs of adjacent clips abutting each other in face-to-face relationship with leg portions interengaging in clip aligning relationship, the method comprising:

positively adding clips successively at one end of a stack in aligned relationship to engage and push preceding clips sidewise in a row under intermittently applied pressure;

adhering a length of pliant adhesive ribbon to said undulating surface area including the trough regions thereof;

repeatedly compressing a trailing portion of said stack by said pressure to tractionally force a rotating cutter to advance and sever said adhered ribbon at predetermined spaced troughs to form a pliant unit of adhered clips; and

releasing said pressure on the trailing clips upon said forced severance of said ribbon to impel the severed unit of predetermined length to a discharge station.

2. In an apparatus for producing a length of ribbon-connected, U-shaped, sheet metal fastener clips having arched crown portions and depending parallel side legs slightly angled to the crown portions with a tongue on one leg to interfit between two on the other leg, in combination:

a framework including an elongated horizontally extending charge table presenting an upwardly facing stacking surface;

a back plate extending along one longitudinal edge of the charge table and projecting upwardly therefrom;

means positioned along said charge table establishing a stacking station;

spaced ribbon-applying and ribbon-severing station arranged successively and in the order named to receive contiguous clips under pressure between them;

means for delivering clips successively and endwise to said stacking station and depositing the same one at a time in a transverse standing position on said charge table and endwise against said back plate;

a longitudinally reciprocable pusher bar disposed at said stacking station and engageable with each thus deposited clip for impelling the same forwardly and sidewise under pressure in their standing position on said stacking surface toward said ribbon-applying station a distance equal at least to the width of a clip to thus create a horizontal stack of transversely aligned contiguous clips wherein the crown portions thereof collectively establish an upwardly facing continuous generally undulatory surface area;

a freely rotatable transfer wheel mounted on said framework at said ribbon-applying station for rotation about a transverse horizontal axis in overlying relationship with respect to the stack of clips entering and passing through such station, said transfer wheel being provided on the periphery thereof with a series of equally and circumferentially spaced radial projections progressively engaging said ribbon the spacing between adjacent projections ebing equal to the overall width of a clip;

a ribbon supply roll rotatably mounted on said framework for supplying a length of pressure sensitive ribbon to said transfer wheel in wrap-around fashion for entry of the ribbon between the transfer wheel and the crown portions of the stack of clips passing sidewise through the ribbon-applying station;

the radial extent of said projections being such that during passage of the clips beneath the transfer wheel the latter will be tractionally driven by its engagement with said advancing clips and adjacent projections will straddle the crown portions of the advancing clips and thus force the ribbon downwardly into the trough portions of said undulatory surface between adjacent clips, thus causing the ribbon to make coextensive engagement with said crown portions; and

means at said severing station tractionally driven by engagement with said undulatory ribbon for peri-

odically severing uniform lengths of the ribbon-connected clips from the stack.

3. In an apparatus for producing a length of ribbon-connected clips, the combination set forth in claim 2, wherein said severing means comprises a cutter wheel mounted on said framework for free rotation about a transverse horizontal axis in overlying relationship with respect to the stack of ribbon-connected clips entering such station;

a cutter blade projecting radially from the periphery of said cutter wheel for entry between adjacent ribbon-connected clips in the stack and passing through said severing station;

said cutter wheel being rotationally powered by a rolling action against said undulatory surface area to sever said ribbon.

4. In an apparatus for producing a length of ribbon-connected clips, the combination set forth in claim 3, wherein the clips are formed of magnetic material and

the back stop is magnetized to hold the clips in aligned sliding contact therewith.

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