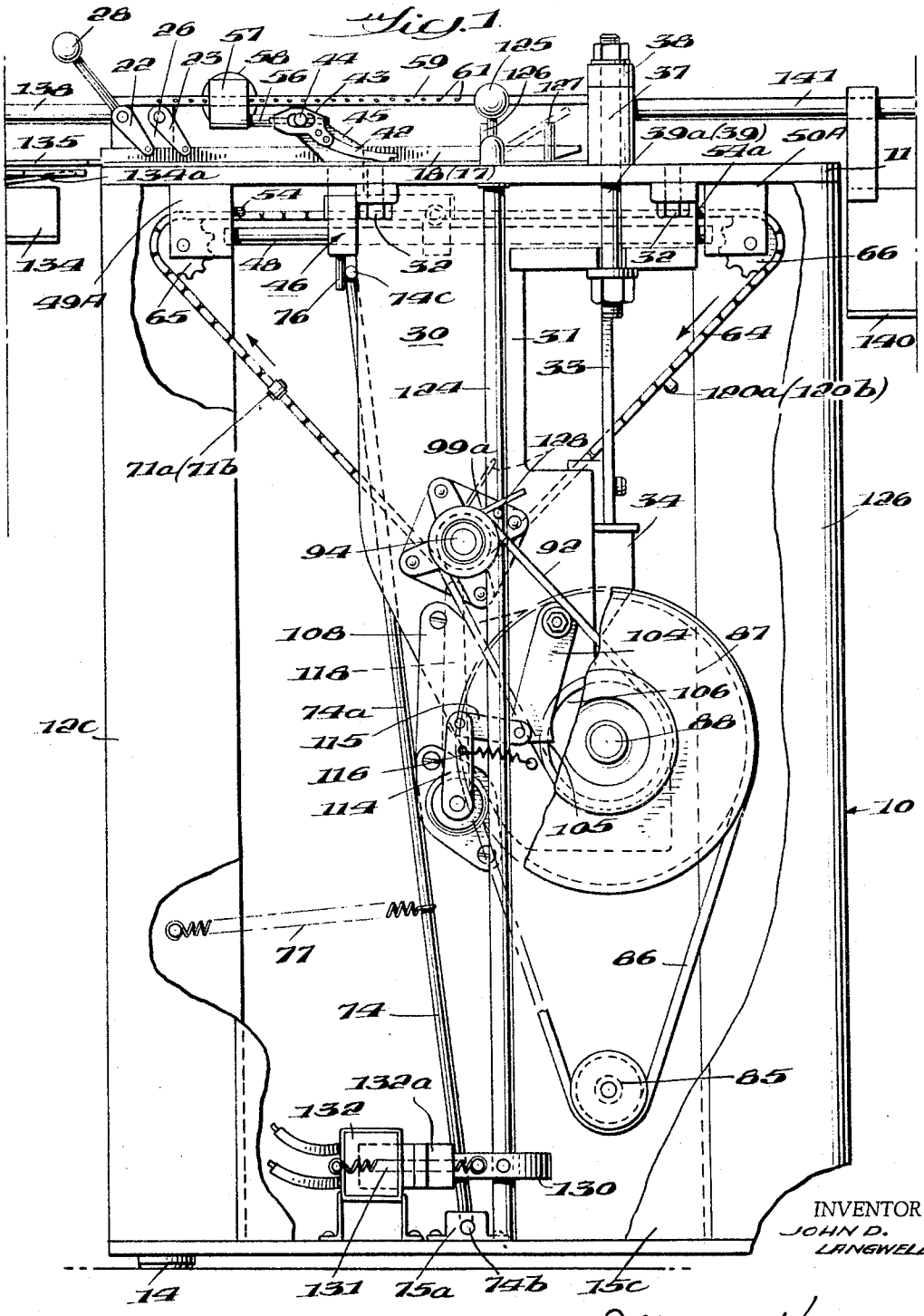
Aug. 2, 1966 J. D. LANGWELL 3,263,542

STRIP MATERIAL FEEDING AND CUTTING-OFF APPARATUS

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Fig. 1.



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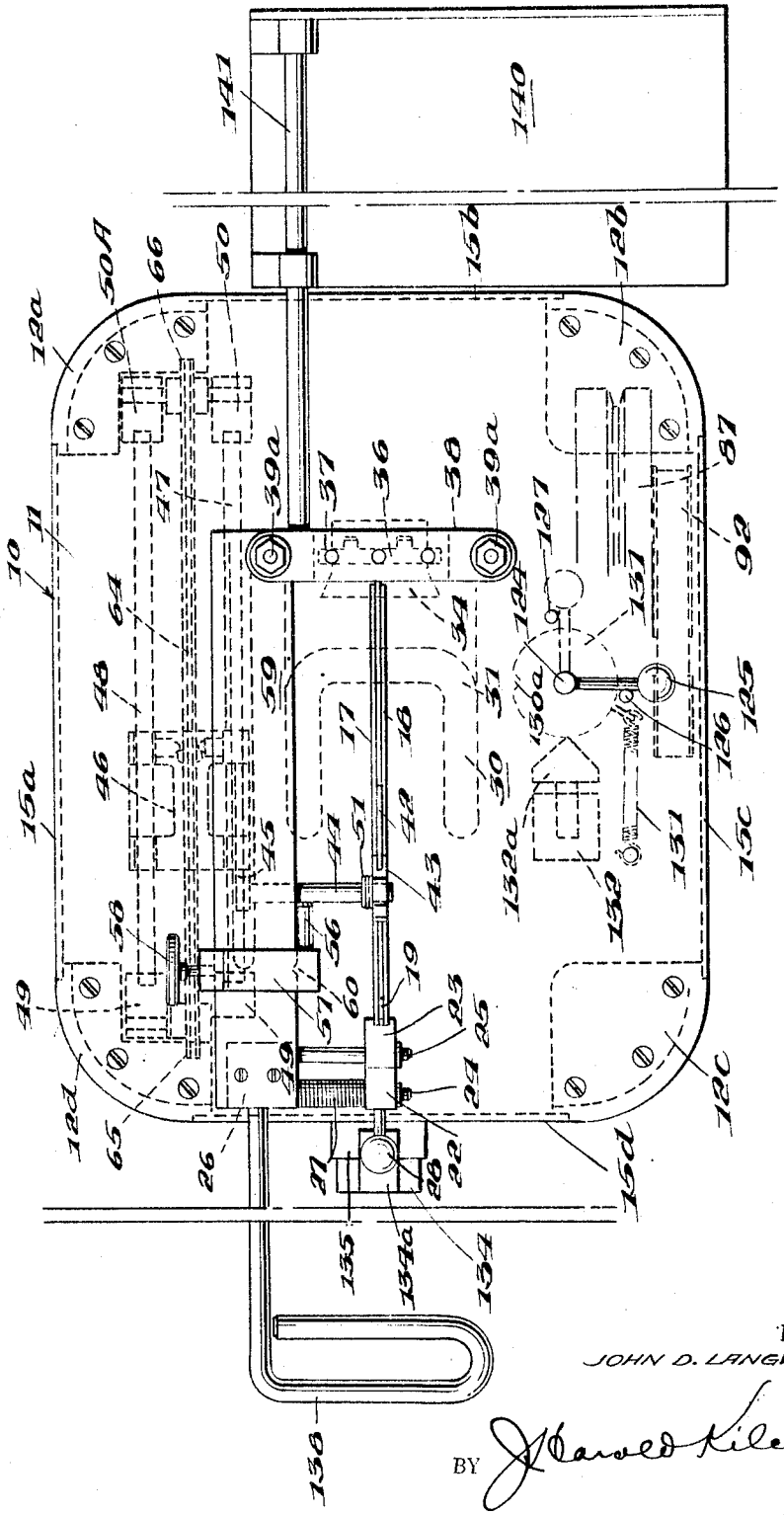


Fig. 2.

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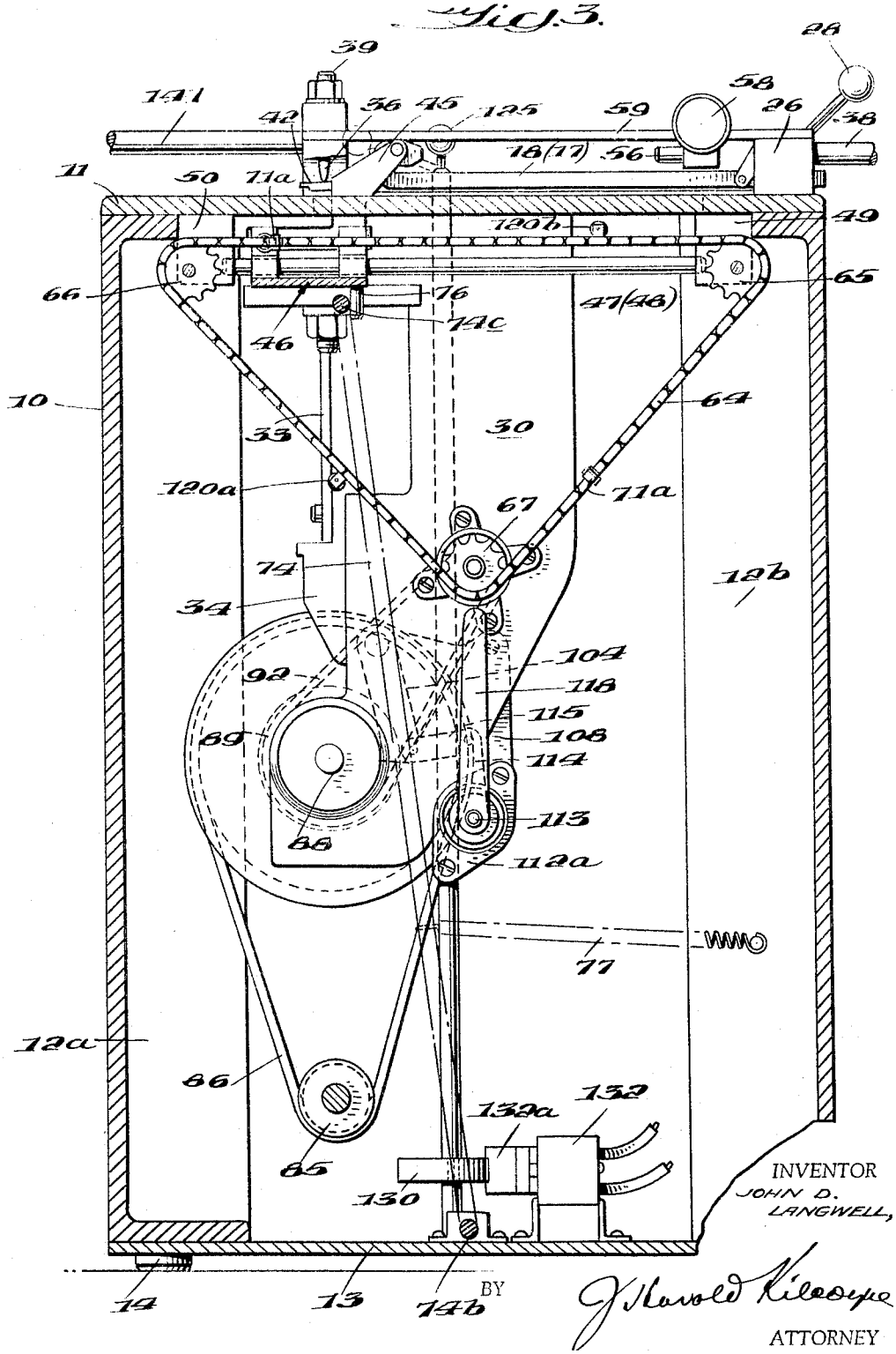
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Fig. 3.



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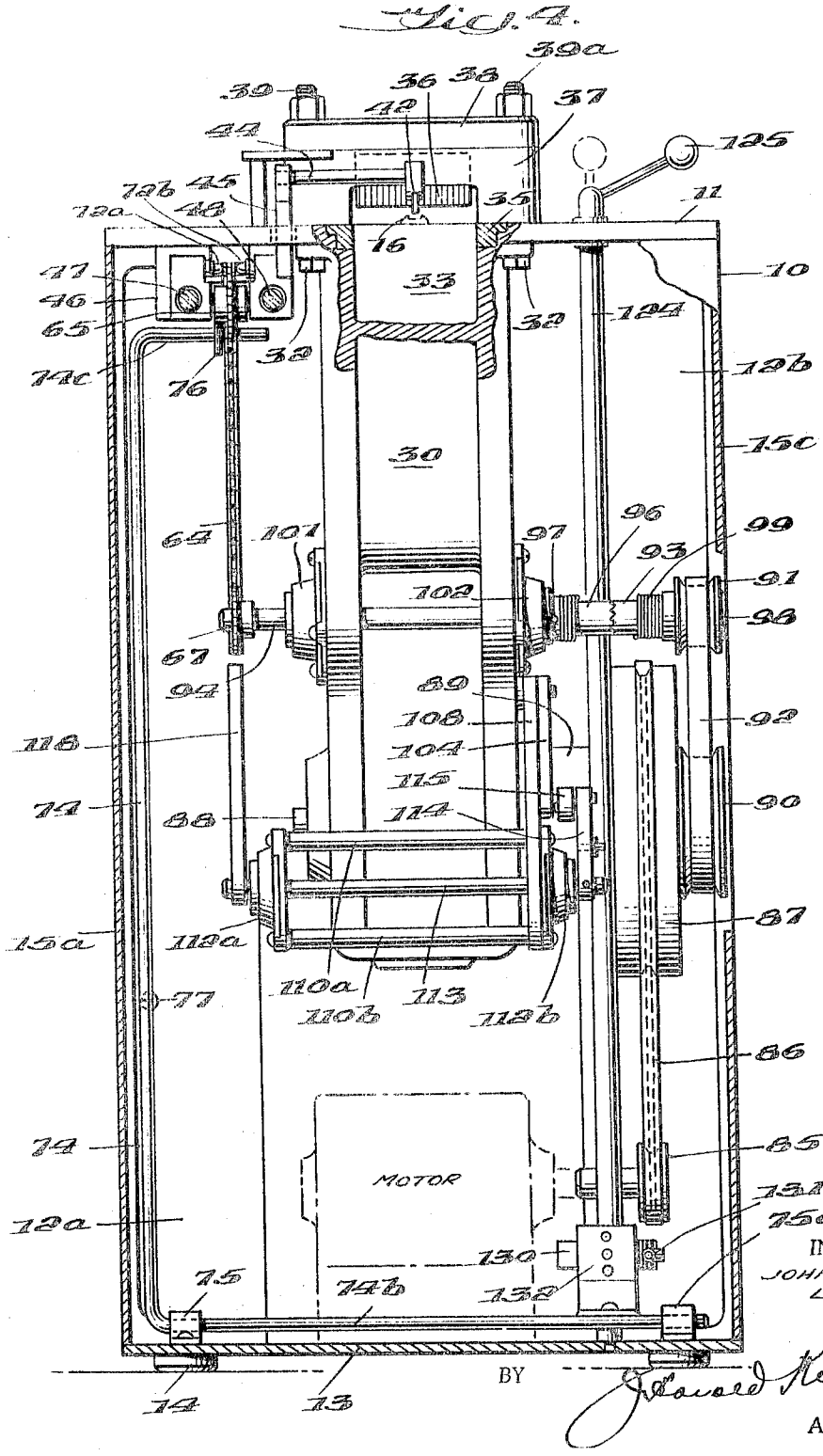
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STRIP MATERIAL FEEDING AND CUTTING-OFF APPARATUS

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Fig. 4.

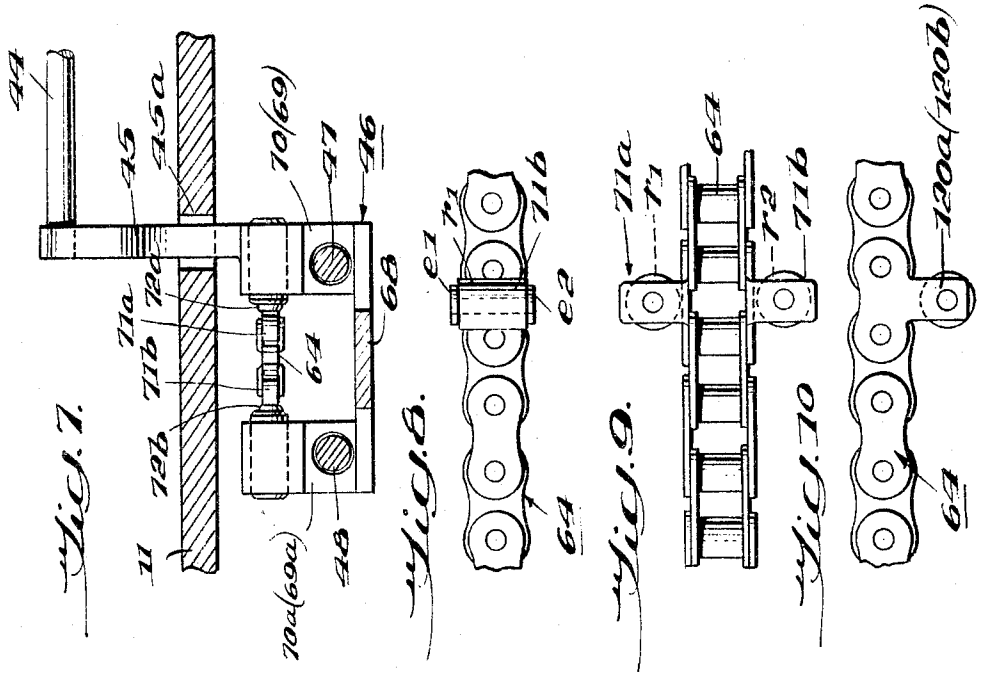


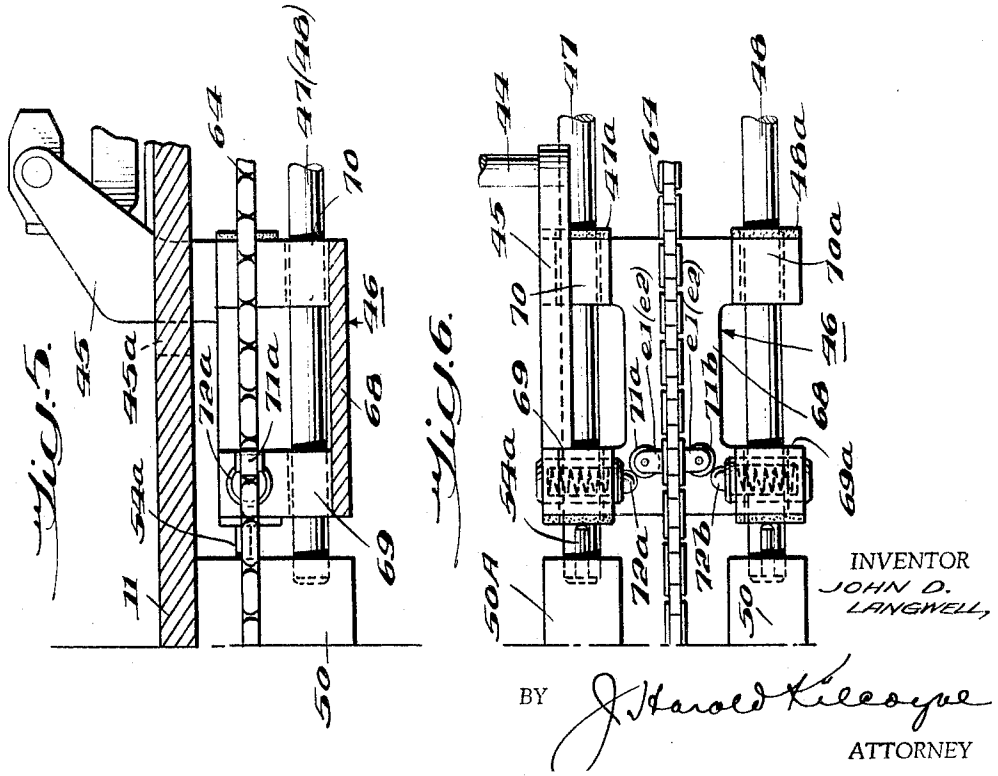
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STRIP MATERIAL FEEDING AND CUTTING-OFF APPARATUS

Filed Jan. 13, 1965 6 Sheets-Sheet 5





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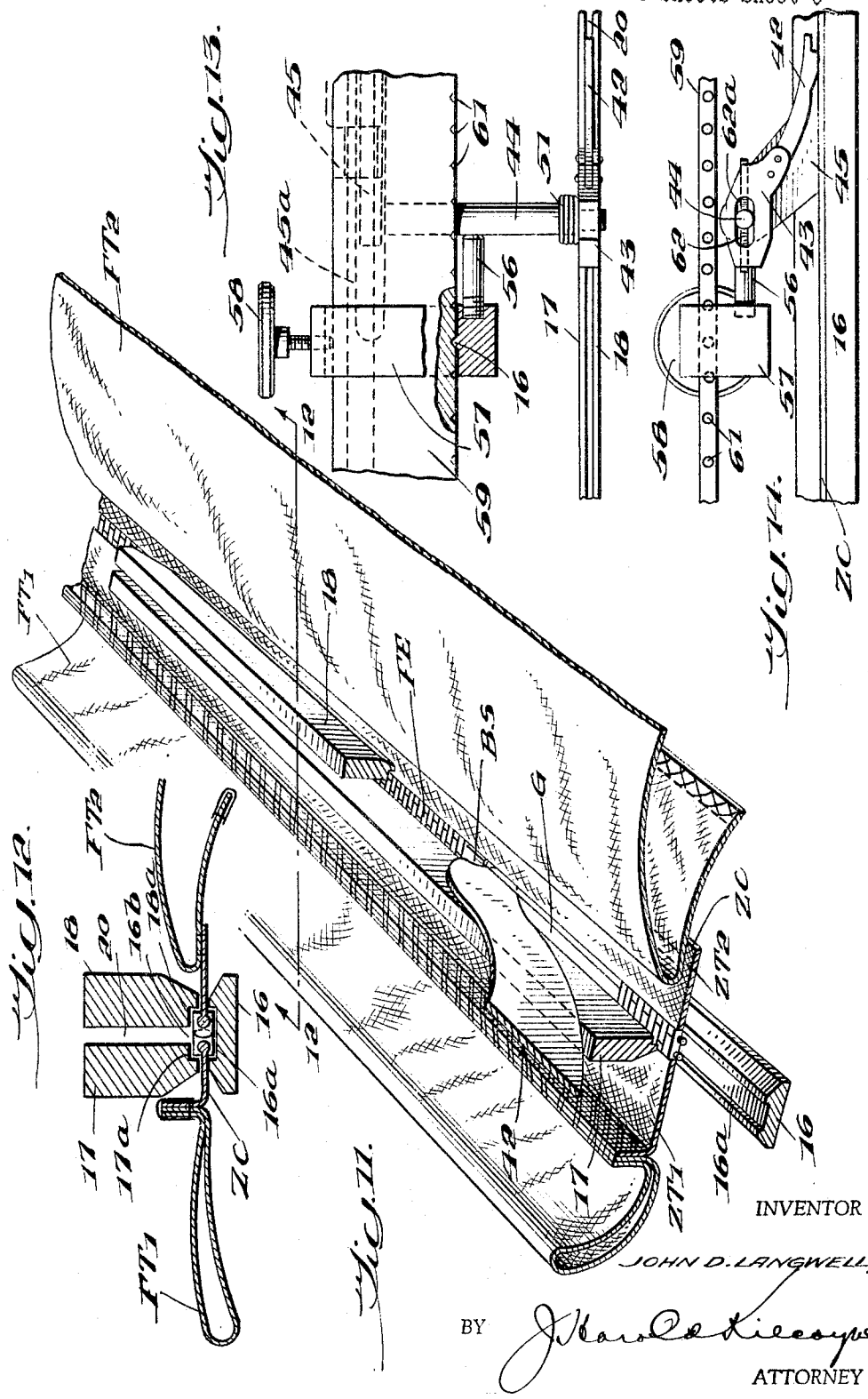
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STRIP MATERIAL FEEDING AND CUTTING-OFF APPARATUS

Filed Jan. 13, 1965 6 Sheets-Sheet 6



United States Patent Office 3,263,542 Patented August 2, 1966

3,263,542

STRIP MATERIAL FEEDING AND CUTTING-OFF APPARATUS

John D. Langwell, Freeport, N.Y., assignor to Waldes Kohinoor, Inc., Long Island City, N.Y., a corporation of New York

Filed Jan. 13, 1965, Ser. No. 425,217
9 Claims. (Cl. 83—241)

This invention relates to improvements in strip material feeding and cutting-off apparatus, and more particularly to apparatus for intermittently feeding indeterminate-length, continuous strips of gapped strip material, through the use of the gaps in said material, to the action of a reciprocating punch-type cutting-off means and for actuating said cutting-off means in timed relation to the continuous strip feeding thereto so that, in the intervals beween feed steps, it successively severs from said strip predetermined lengths thereof as said lengths feed to a position just in advance of said cutting-off means.

Although usable in any and all applications to which it is or may be found to be suited, the apparatus of the invention was designed for and has proved highly effective in cutting off measured lengths of slide fastener or zipper chain with trouser-fly strips assembled thereto, known in the art as trouser- or pants-fly closure units, from long lengths of continuous zipper chain which has been "gapped" so as to provide element-free short lengths of zipper tapes between successive longer element-studded lengths of the tapes which ultimately provide the individual zipper components of said closure units and to which the slider bottom stops have been applied to one end of each of said element-studded lengths, and which further have sewn thereto two continuous tapes which ultimately provide the fly-piece components of said closure units. For further details as to the nature and manner of production of the continuous gapped zipper chain with continuous fly strip tapes assembled thereto which constitutes the continuous "strip material" for the feeding and cutting off of measured lengths of which the apparatus of the present invention was designed, reference is had to copending application of George Waldes Serial No. 403,073, filed October 12, 1964, entitled, "Art of Producing Trouser-Fly Closure Units," which with the present invention is commonly owned.

Stated broadly, it is an object of the present invention to provide practical, effective and thoroughly dependable apparatus for cutting off a succession of individual trouser-fly closure units of desired length from a long length of continuous gapped zipper chain having continuous fly-strip tapes assembled thereto.

More particularly, it is an object of the present invention to provide fully automatic and cyclically operable apparatus for positively feeding a succession of measured trouser-fly closure unit lengths of continuous gapped zipper chain with continuous plural fly-strip tapes properly assembled thereto, by means including the gaps in said zipper chain, to a reciprocating cut-off punch which on each working stroke thereof cuts off the measured length of said zipper chain and tape assembly which has just previously been advanced to a cut-off position, i.e. a position just forwardly of said punch.

A further object of the invention is the provision of apparatus as aforesaid characterized by a chain and plural tape feeding means of a type which operates through the gaps provided between successive element-studded lengths of the zipper chain.

Another object of the invention is the provision of chain and tape feeding means as above which incorporates simple and highly effective means for adjusting the increment of chain and tape feed to that desired for a particular run

of trouser-fly closure units to be produced at any given time.

Still another object of the invention is the provision of apparatus as aforesaid and which further incorporates both highly practical manual machine start and stop means and automatic stop means, the latter being operative to stop the apparatus when the supply of the continuous zipper chain and fly-strip tape assembly to be cut into individual trouser-fly closure unit lengths runs out.

The above and other objects and features of advantage of strip material feeding and cutting-off apparatus according to the invention will appear from or be obvious from the following description thereof, in which reference is had to the accompanying drawings illustrative of said apparatus as it has been embodied in commercial form, in which:

FIG. 1 is a broken-away side elevation of the apparatus of the invention as viewed from the drive means side thereof, the view illustrating the strip material feeding means in an intermediate position through which it moves in advancing from left to right in said view;

FIG. 2 is a top plan view of the apparatus shown in FIG. 1, with additional parts thereof only fragmentarily shown in FIG. 1 being illustrated;

FIG. 3 is a broken-away, part-sectional and side elevation of the apparatus taken from the side thereof opposite that shown in FIG. 1, i.e. the sprocket chain and carriage side;

FIG. 4 is an end view of the apparatus taken from the right end of FIG. 3, with some parts broken away and/or shown in section;

FIGS. 5, 6 and 7 are fragmentary views which illustrate details of the carriage and of the releasable driving connection between the sprocket chain and said carriage, which parts constitute essential elements of the strip material feeding means of the apparatus shown in the preceding view;

FIGS. 8 and 9 are fragmentary views of the endless sprocket chain which illustrate a form of attachment thereon functioning to actuate the carriage component of the feeding means throughout its working stroke;

FIG. 10 is a detail view similar to FIG. 8 but which illustrates the form of an additional attachment on the aforesaid sprocket chain serving to control the actuation of the cutting-off punch;

FIG. 11 is a fragmentary part-sectional view illustrating details of the strip material (continuous zipper chain and plural continuous fly-strip tapes assembled thereto) guiding and hold-down means;

FIG. 12 is a section taken generally along line 12—12 of FIG. 11; and

FIGS. 13 and 14 are fragmentary plan and side elevational views of the strip material feeding means, which illustrate details of the means for adjusting the length of the working stroke of the reciprocating carriage and feed finger of the strip material feeding means and thereby the length that the strip material is advanced with each stroke of the feed finger.

As previously indicated, strip material feeding and cutting-off apparatus of the invention, while not limited thereto, was designed to accept as its starting material to be cut into individual trouser- or pants-fly closure unit lengths, a long length of continuous "gapped" slide fastener or zipper chain having plural continuous fly strip tapes assembled and secured thereto in the manner disclosed and claimed in the aforesaid George Waldes application Serial No. 403,073. By "gapped" slide fastener or zipper chain as used herein is meant continuous zipper chain consisting of two long lengths of coupled zipper stringers, i.e. fabric tapes carrying along adjacent edges initially unbroken rows of oppositely disposed interlock-

ing fastener elements and which are secured together by the coupling action of said elements, from which a small number of the fastener elements are removed at a succession of short-length intervals of the chain disposed between individual zipper lengths of chain proper, the removal of elements which results in "gapping" of the chain being for the purpose of providing element-free tape extensions at the end of each individual zipper length of chain which facilitate the sewing of the zipper ends to the trouser waistband and crotch, in the case of the individual zipper lengths being used as a component of a trouser- or pants-fly closure. Preferably also, the bottom stops which serve to prevent the sliders of the final zippers from running off the bottom ends thereof have already been applied to the gapped chain and fly-strip tape assembly going to the herein apparatus and, as will hereinafter appear, the gapped zipper chain and fly-strip tapes assembled thereto advancing to said apparatus will have been turned about the longitudinal center line thereof so that the normally under or back side of the zipper chain faces upwardly and will further have been disposed end-to-end so that the aforesaid bottom stops are disposed at the rearward or trailing end of each of the individual zipper lengths making up the gapped continuous zipper chain-fly strip tape assembly feeding to the apparatus. With the chain so positioned, a bottom stop will be disposed at the forward end of each chain gap; and thus the bottom stops are capable of providing an abutment surface for a blade-like feed finger insertible into the gaps.

GENERAL DESCRIPTION

With the above brief statement of the nature and physical characteristics of the strip material for which the herein apparatus was designed to work upon and which contribute to the proper functioning of said apparatus as intended, there is first given a general description of said apparatus in terms of the principal physical means or mechanisms making up the same. More particularly, the apparatus of the invention incorporates:

(a) guide and hold-down means capable of accepting strip material in the form of continuous "gapped" zipper chain and plural continuous fly-strip tapes assembled thereto and of guiding said assembly along a straight-line path of movement, said means also serving to hold the continuous fly strip tapes which normally assume positions in which they respectively overlie and underlie the zipper chain in positions in which they extend laterally thereof;

(b) punch-type cutting-off means disposed astride the path of movement of said chain and tapes assembled thereto;

(c) means for advancing (feeding) the zipper chain and fly-strip tape assembly along said path with a step-by-step motion and in measured lengths or increments corresponding to the length of the individual trouser-fly closure units then being produced, past said cut-off means, said advancing or feeding means being of a type depending on the above-described gapping of the zipper chain for its operation; and

(d) means for driving both said feeding means and said punch-type cutting-off means in properly timed relation, i.e. so that the latter means will sever the most forward length of zipper chain and fly strip tape assembly which has just previously been fed past the same, during the interval between each two successive increments of feed motion imparted to said chain and tape assembly.

Illustratively, all of the aforesaid means are mounted on or enclosed within a generally rectangular cabinet-type stand adapted to be supported on a building floor. More particularly, the guide and hold-down means are mounted to the upper side of the top plate of the stand, thus to be readily available to the continuous zipper chain and plural fly strip tape assembly moving to the top plate in continuous strip form. The punch type cutting-off means is mounted from said top plate so that it operates through same, and the feeding and cutting-off drive means and their related mechanisms for properly timing their respective operations are enclosed within the housing. Manual control means for starting and stopping the operation of said drive means and thereby of said apparatus as a whole are provided. Upon the apparatus being placed in operation, it continues to operate in successive cycles until manually stopped or until the supply of the continuous zipper chain and plural tape assembly runs out, in which latter event operation of the apparatus is stopped automatically. Said manual control and automatic stop means will be more specifically described under the caption "Control Means."

DETAILED DESCRIPTION

The guide and hold-down means

The stand **10** on or within which the aforesaid major means or mechanisms of the apparatus of the invention are mounted illustratively comprises a rounded-corner rectangular top plate **11** secured at its corners as by screws to four corner legs 12*a*–12*d* inclusive, which in turn are fastened to a base plate **13** which is supported on but above the floor by vibration mounts **14**. Cover plates 15*a*–15*d* (FIG. 2) may be fastened to said corner legs and serve to fully enclose the stand on all four sides.

Referring to FIGS. 1, 2, 11 and 12, the aforesaid continuous zipper chain-fly strip tape assembly guide and hold-down means illustratively comprises an elongated chain-guide strip **16** and disposed above same and coacting therewith two elongate chain hold-down bars **17** and **18** disposed on edge and being laterally spaced from one another by a spacer element **19** (FIG. 2), whereby said bars define an elongate slot **20** whose function will be explained hereinafter. Said guide strip **16** is secured flush against the upper face of the top plate **11** (as by screws not shown) in position such that it coincides substantially with the longitudinal center line of said top plate and its length is such that it extends from the strip feed-in edge of the top plate about two-thirds across the latter. The hold-down bars **17** and **18** have length generally corresponding to that of the guide strip **16** but, rather than being fixed, are mounted for raising and lowering movement, it being understood that when raised they are in an inactive position and that when lowered they are in their working or hold-down position, in which latter they are shown in FIGS. 11 and 12.

More particularly, said hold-down bars adjacent the feed-in end of the top plate are pivotally connected at their relatively rearward (feed-in) ends to a pair of depending, parallel bracket arms **22, 23**, whose upper ends are fast on rock shafts **24, 25**, respectively, extending laterally from and journaled for rocking motion in a mounting block **26** affixed to the upper surface of the top plate **10** to one side of the guide strip **16**. A spring **27** encircling the rock shaft **24** exerts clockwise (FIG. 2) turning pressure on the bracket arm **22** (and accordingly on both said bracket arms) and thereby downward pressure on the hold-down bars **17, 18**, which is sufficient as to keep the zipper chain component ZC (FIGS. 11 and 12) of the zipper chain and fly strip tape assembly constituting the strip material being worked upon and which, according to the intended operation of the apparatus, runs along the top of the guide strip **16** in proper position thereon. A ball-type handle **28** affixed to said bracket arm **22** enables the operator to manually swing said bracket arm, and thereby both said bracket arms **22** and **23** since they are constrained to move in unison, in counterclockwise direction as effects raising of the hold-down bars, when it is desired to insert an end of the zipper chain to be moved along the guide strip between said guide strip and said hold-down bars.

As also seen in FIGS. 11 and 12, the guide strip **16** is provided in its upper face with an upwardly open channel **16***a* having width substantially equal to the width of two oppositely disposed coupled fastener elements FE of the

two rows thereof connected to the fabric zipper tapes ZT_1 and ZT_2 and which with said tapes make up the aforesaid zipper component of the zipper-chain fly tape assembly, and depth slightly less than one-half of the vertical thickness of said fastener elements. A downwardly opening complemental channel **16***b* may be simply provided by cutting away the bottom inside corners of the hold-down bars **17**, **18** as at **17***a*, **18***a* to a depth and width corresponding to that of the depth and width of the guide strip channel **16***a*. Thus there is provided between the guide strip and hold-down bars an elongated guideway closely fitted to two rows of the coupled fastener elements FE of the zipper chain serving to guide the latter along a fixed path of movement. It is to be noted, however, that the bottom edges of the hold-down bars **17**, **18** are spaced a small distance from the upper surfaces of the guide strip **16**, thereby to provide slit-opening side openings extending laterally from said guideway for the accommodation of the zipper tapes ZT_1 and ZT_2. Also to be noted at this point of the description is that the aforesaid slot **20** provided by the lateral spacing of the hold-down bars **17**, **18** opens into said elongated guideway through the top side thereof. Preferably also, and as best seen in FIG. 12, the outer bottom corners of the hold-down bars **17**, **18** are cut away, thereby to provide added space for the accommodation of the continuous fly-strip tapes FT_1 and FT_2 assembled to the zipper chain tapes ZT_1 and ZT_2, according to the aforesaid George Waldes application Serial No. 403,073, when the latter tapes are folded laterally outwardly from their normal positions to their respective positions shown in FIG. 12, which latter positions they occupy during the cutting-off operation.

THE CUTTING-OFF MEANS

The aforesaid cutting-off means comprises a standard press generally designated **30** mounted to the stand **10** in an upside down position. More particularly, the press frame **31** is secured upside down to the under face of the top plate **11** as by corner bolts **32** (FIG. 1) in a position such that its cutting-off anvil **33**, which is carried by the reciprocating ram **34** of the press and which upon reciprocation of the ram moves upwardly through an anvil guide **35** set into an opening provided therefor in said top plate (FIG. 4), is disposed transversely to the path of feed motion of the strip material, i.e. zipper chain and fly strip tape assembly, moving along the guide strip **16**. The reciprocating anvil is adapted to move against a fixed cutting-off blade **36**, illustratively a so-called pinking blade, which is disposed above the top plate and, like the anvil **33**, transversely of the feed path of said strip material. Illustratively, said cutting-off blade is mounted in a blade-mounting bracket **37** which, together with its cover plate **38**, is secured to the top plate **11** by tie rods **39**, **39***a*, which also rigidly connect said blade-mounting bracket with the press frame **31** disposed beneath the top plate. As best seen in FIG. 1, the anvil **33** and its associated cutting-off blade **36** are disposed relatively forwardly of the guide strip **16** and hold-down bars **17** and **18**, and thus the cutting anvil may partake of its reciprocating motion without interference from said guide strip or hold-down bars.

THE STRIP MATERIAL FEEDING MEANS

The strip material (continuous zipper chain and fly strip tape assembly) feed means in the first instance comprises a reciprocatory, vertically disposed, blade-like finger **42** spring-biased to a position in which its free working end moves into the gaps designated G (FIG. 11) of the aforesaid zipper chain component ZC, it being understood that one such gap is disposed between each two individual-length but still connected trouser-fly lengths of chain making up said zipper chain component, and means associated with said finger for actuating same in direction and in amount required to advance the zipper chain (and of course the fly strip tapes FT_1 and FT_2 assembled thereto) a distance corresponding to the length of the trouser-fly closure units being produced, as results in the working end of the reciprocating finger, as the latter is actuated throughout its working stroke, moving against the trailing end, i.e. bottom end, of each trouser-fly length of zipper chain and pushing the same, and thereby the entire chain-tape assembly, forwardly a predetermined distance as aforesaid. To insure good engagement of the working end of the feed finger **42** of the zipper bottom end, the gapped zipper chain moving to the apparatus will preferably have the bottom stops BS, conventionally applied to the bottom ends of most zippers for the purpose of preventing unintentional removal of the slider therefrom, already applied thereto in a preliminary operation, again as disclosed and claimed in the aforesaid George Waldes application Serial No. 403,073.

More particularly, and referring to FIGS. 1, 13 and 14, the feed finger **42** is dependently carried by a bracket **43** affixed to a shaft **44** which extends laterally from a vertically extension bracket **45** mounted on a reciprocatory carriage generally designated **46** disposed below the top plate **11** (and thus within the stand **10**) and which is slidable on a pair of horizontal, laterally spaced slide rods **47**, **48** supported at their ends in slide-rod mounting blocks **49**, **49A** and **50**, **50A** affixed to the under side of the top plate **11**. As best seen in FIGS. 4 and 7, said extension bracket **45** extends upwardly from the carriage **46** through a slot-like opening **45***a* provided therefor in said top plate.

A coil spring **51** (FIG. 13) encircling the shaft **44** imposes a downward bias on the working end of the feed finger **42**, which insures both that said working end will find its way into any gap G of the zipper chain disposed below the same and that it will ride over the coupled fastener elements of the next following length of gapped continuous chain when the carriage **46**, and hence the extension bracket **45**, shaft **44** and said feed finger, together partake of their return or retracting movement, in response to means to be described. At this point of the description, it is explained that the feed finger **42** extends to the zipper element guideway provided by the aforesaid complementary channels **16***a* and **16***b* through the aforesaid slot **20** provided between the hold-down bars **17** and **18**. Thus, while the slot will be formed wide enough to permit the feed finger to operate therethrough freely as intended, said hold-down bars insure against any uncontrolled lateral movement of the feed finger as it partakes of its back-and-forth movement with the carriage **46**.

Means such as the stop pins **54**, **54***a* projecting towards one another from the slide-rod mounting blocks **49**, **49***a* serve as back and front stops for the carriage **46** and thus determine the extreme limits of its travel in both directions and thereby the maximum amount or increment that the zipper chain ZC and fly-strip tapes assembled thereto can be advanced with each feed stroke of the finger **42**. However, additional back-stop means of an adjustable nature are provided, such illustratively comprising an adjustable-position back-stop pin **56** disposed in the path of rearward movement of the feed-finger mounting shaft **44**, and which is carried by an adjustable-position two-piece bracket **57**, the two pieces of which, as best seen in FIG. **13**, are screwed together and clamped by a screw **58** to an elongated back-stop slide plate **59** extending between and secured at its ends to the aforesaid mounting block **26** and the cutting blade mounting bracket **37**, respectively. The bracket **57** is also provided inwardly thereof with a pointed projection **60** which is adapted to seat in any one of a plurality of holes **61** drilled or otherwise provided in the associated edge of the slide plate **59**. Thus, the back-stop bracket **57** may be secured in any desired position along the length portion of the slide plate edge provided with said holes **61**, by seating the projection **60** in a selected one of said holes and then tightening the bracket screw **58**. The bracket-carried and hence ad-

justable-position back-stop pin **56** then takes over the function of the fixed back-stop pin **54** in determining the most rearward position of the feed finger **42** and thereby the length of stroke of said finger and in turn the increment that the zipper chain and fly-strip tape assembly is fed forwardly by said finger on each of its working strokes.

Further adjusting means enabling the adjustment of the lines of cut along the length of the gaps G of the zipper chain and thereby of the length of the element-free tape extensions at the ends of the individual zipper chain lengths being severed from the continuous zipper chain are preferably provided. For this purpose, the opening **43***a* in the feed-finger or blade-mounting bracket **43** through which the aforesaid feed finger-mounting shaft **44** extends is elongated horizontally (FIG. 14) as permits said bracket to be shifted a small distance backwardly or forwardly along said opening. To locate and lock the bracket **43** in a desired adjusted position, oppositely disposed set screws **62**, **62***a*, whose inner ends extend into the ends of said opening **43***a* and are adapted to be screwed tight against said shaft **44**, are provided.

The means for advancing (and of course retracting) the feed finger **42** includes the aforesaid reciprocatory carriage **42**, since motion of the vertical extension bracket **45** and of the finger-mounting shaft **44** carried by said bracket is derived from that of the carriage. According to the invention, said carriage which, as explained in the foregoing is mounted to slide on the slide rods **47**, **48** (on ball bushings **47***a*, **48***a*, FIG. 6) is positively driven throughout its forward or zipper-chain advancing stroke by means of a powered endless sprocket chain **64** running in a triangular path over two horizontally disposed idler sprockets **65**, **66** mounted intermediate the aforesaid slide-rod mounting blocks **49**, **49A**, **50** **50A**, and an intermediate lower-level drive sprocket **67**, via a releasable driving connection to be described in detail which the chain makes with said carriage at spaced time intervals through its endless path of travel. Upon release of said driving connection, the carriage is then driven on its return (back) stroke by a spring-biased arm **74** which, as will be described, is itself moved to an energy-storing position by the carriage responsive to its forward movement as aforesaid, and which upon release or deactivation of said driving connection releases its energy to drive the carriage throughout its backward stroke.

Referring to FIGS. 5–9 inclusive, intended to illustrate the aforesaid "releasable driving connection" between the endless sprocket chain **64** and the carriage **46**, it is first to be noted that the carriage illustratively comprises a bottom plate **68** mounting forward and rearward pairs of laterally spaced apertured ears **69**, **69***a* and **70**, **70***a* through which the slide rods pass, the carriage thus defining a generally upwardly opening channel in transverse section, and that the channel thus provides a runway for said sprocket chain. As best seen in FIGS. 6–8, the releasable driving connection illustratively comprises laterally outwardly projecting chain attachments **71***a*, **71***b*, each consisting of a pair of vertically spaced ears e_1, e_2, with rollers r_1 and r_2 mounted on vertical pintles extending between the ears of the pairs, and spring-backed ball plungers **72***a*, **72***b* mounted on the forward pair of carriage ears **69**, **69***a* in position as to extend into the path of said rollers r_1, r_2 of the sprocket-chain attachments which, with the sprocket chain, move through the channel defined by the carriage **46**, and to be abutted by said rollers r_1 and r_2. This arrangement provides, in the first instance, that upon the chain attachments **71***a*, **71***b* in their movement through the carriage channel first abutting the spring-backed ball plungers **72***a*, **72***b*, said attachments and plungers coact to provide a driving connection between the chain and carriage, and that upon the carriage having been moved by and along with the chain to a forward position in which it engages against and is held against further forward movement by the aforesaid front-stop pin(s) **54***a*, the chain attachments overcome the force of the springs backing the ball plungers **72***a*, **72***b* and thereby deactivate and render ineffective the driving connection between chain and carriage which existed up to this point of chain travel. Thereupon the chain moves freely through the carriage and the latter is now free to partake of its rearward travel under the action of the aforesaid spring-energized arm **74**.

Referring to FIGS. 3 and 4 in particular, said arm **74** illustratively consists of a rod having an elongated vertical portion **74***a*, a lower horizontal mounting and pivot end **74***b* which, as best seen in FIG. 4, is journaled in spaced pillow blocks **75** and **75***a* affixed to the base plate **13** of stand **10**, and an upper horizontal crank end **74***c* which is disposed at a level somewhat below that of the aforesaid carriage **46**, so as to be engageable by a pin **76** affixed to and depending from the under side of the carriage. Illustratively, a coil spring **77** is connected at its ends to said vertical-rod portion **74***a* of said arm and to a leg on the stand, respectively, so as to be stretched as the arm is swung clockwise (FIG. 1) and counterclockwise (FIG. 3) responsive to the forward travel of said carriage. However, upon release of the releasable driving connection between the carriage and sprocket chain **64** as explained above, the arm **74** is positively swung to its normal position by the energy stored in the spring **77** by the stretching thereof, and in so doing actuates the carriage throughout its return or retracting stroke.

Generally speaking, while the number of the chain attachments **71***a*, **71***b* per chain will vary with the length of the chain, two sets of attachments, equally spaced from one another, are provided along the length of the aforesaid chain **64**. Thus, for each complete cycle of sprocket chain travel, the carriage **46** is driven throughout two working and return strokes, as in turn results in the continuous zipper chain ZC and fly strip tapes FT_1 and FT_2 assembled thereto being given two feed steps or increments by the feed finger **42**.

THE DRIVING MEANS

Referring to FIGS. 1, 3 and 4, a motor M (or other convenient power source) drives a main drive pulley **85**, which latter drives through a belt **86** both a flywheel **87** adapted to drive both the crank shaft **88** of the cutting-off press **30** through a normally disengaged clutch generally indicated at **89**, and a pulley **90** associated with the flywheel which in turn drives a clutch pulley **91** disposed upwardly thereof via a belt **92**. The clutch pulley **91** is press-fitted to a bushing **93** which rotates on a shaft **94**, the bushing being held in place axially on said shaft between a bushing **96** fixed to said shaft by a pin **97** and a suitable retaining means **98** on the outer (right) end, FIG. 4, of said shaft. A spring **99** is tightly wound on the so axially related bushings **93**, **96** in manner such that said bushings and spring together form a well known type of spring clutch serving to transmit drive from drive pulley **85** to the shaft **94** via belt **86**, flywheel **87**, pulley **90**, belt **92** and pulley **91**. As will be later explained, said clutch combination **93**, **96** and **99** is of the normally engaged type, but its engagement is controllable by the operator.

As best seen in FIG. 4, the aforesaid shaft **94** extends through the uprights of the press frame **31**, being supported in ball-bearing pillow blocks **101**, **102** affixed to the outer sides of said uprights. At its end opposite that mounting the clutch pulley **91**, the shaft **94** fixedly mounts the aforesaid drive sprocket **67** for the sprocket chain **64** which drives the carriage **46** as aforesaid. Thus, assuming engagement of the clutch combination **93**, **96**, **99**, the sprocket chain is continuously driven from the drive pulley **85**.

Referring to FIGS. 1, 3 and 4, the clutch **89** which transmits drive to the press crank shaft **88** is normally held disengaged by a lock-out pawl **104** whose working end abuts the step or shoulder **105** of a trip cam **106** fast on

the driving element of said clutch. Means are provided for deactivating, i.e. releasing, said locking pawl and thereby energizing the clutch **89**, as results in the crank shaft **88** of the press **30** being driven throughout a full 360° turn and accordingly in the press ram **34** and its cutting-off anvil **33** being positively actuated throughout one complete cycle of motion, responsive to travel of the sprocket chain **64**. More particularly, such means illustratively comprises a bracket plate **108** affixed to an upright of the press frame which is disposed adjacent the clutch **89**, to which the lock-out pawl **104** is pivotally connected for swinging movement by an upper-end pivot **109**. Said bracket **108** also provides anchorage for two tie rods **110***a*, **110***b* extending transversely towards the chain side of the apparatus and which provide a mounting for the spaced pillow blocks **112***a*, **112***b* in turn providing bearing for a transversely disposed rock shaft **113**.

At its clutch end, said rock shaft rigidly mounts a secondary, i.e. driven, release lever **114** having generally upright disposition, and a link **115** is pivotally connected to and extends between the upper end of said lever and the lower end of said lock-out pawl **104**. A spring **116** operative between said lever **114** and the bracket plate **108** serves to bias said lever in clockwise direction (FIG. 1), as results in said lock-out pawl **104** being normally biased into engagement with the step **105** of the trip cam **106**.

At its other or chain end, said rock shaft **113** rigidly mounts a primary (driving) release lever **118** which, by reference to FIGS. 3 and 4 in particular, is vertically disposed, is contained in the working plane of the endless sprocket chain **64** and is moreover of length such that its upper end is disposed just beneath the lowermost line of motion of said chain as it runs under the chain drive-sprocket **67**.

To enable chain actuation of the lock-out pawl releasing means, the sprocket chain is provided with a pair of chain attachments **120***a*, **120***b* which compare generally with the aforesaid attachments **71***a*, **71***b* but which, as is best seen in FIG. 10, extend vertically outwardly from said chain, rather than laterally outwardly, as did the attachments **71***a*, **71***b*. Thus, as the chain moves throughout its course of travel, the attachments **120***a*, **120***b* will at two spaced times during such travel strike the upper end of the primary release lever **118** and thereby rock the shaft **113** and as in turn swings the secondary release lever **114** in counterclockwise direction (FIG. 1). Such results in pull being exerted on the link **115** in direction as to disengage the locking pawl **104** from the step **105** of the trip cam **106**. Thereupon, the clutch **89** automatically engages and the press crank shaft **88** is driven for one complete revolution, following which the locking pawl, acting under the bias of spring **116**, again locks out said clutch by its repeat engagement with said step **105** of the trip cam.

While it is stated in the foregoing that the chain attachments **120***a*, **120***b* are two in number, it should be understood that such follows from the fact that the number of said attachments corresponds to the number of the horizontally projecting attachments **71***a*, **71***b*; that is to say, the number of the chain attachments **120***a*, **120***b* is always the same as the number of the chain attachments **71***a*, **71***b*. Also to be noted and understood is that the attachments **120***a*, **120***b* trail the attachments **71***a*, **71***b*, respectively, by equal lengths of sprocket chain which are such as to properly time the actuation of the cutting-off punch to occur during the interval that the carriage **46** is moving on its backward stroke, during which interval the zipper chain and fly-strip tape assembly, after having been fed forwardly a distance corresponding to the length of the closure units, is being held stationary with respect to the top plate **11** by the action of the aforesaid hold-down bars **17**, **18**. At this point in the description, reference is also had to the fact that with each stroke of the carriage-propelled feed finger **42**, the chain and tape assembly is advanced to a position that the predetermined length thereof to be severed is disposed forwardly of the cutting-off blade **36** of the press, and since said press is disposed relatively forwardly of the guide strip **16** and hold-down bars **17** and **18**, forwardly of said latter parts, unimpeded operation of the press is achieved.

THE CONTROL MEANS

Referring to FIGS. 1, 2 and 4 in particular, manual control means for initiating and stopping the operation of the herein apparatus are provided, such illustratively comprising a vertically disposed rod **124** extending between the top and base plates **11**, **13** of the stand **10** and being mounted for turning movement therein. The upper end of said rod projects through the top plate **11** and mounts a ball handle **125** which normally rests in a "stop" position against an upwardly projecting pin **126** set into said top plate, but it may be moved 90° to a "start" position in which it rests against a similarly mounted pin **127**. In its intermediate length portion, the rod **124** mounts a laterally projecting pin **128** serving as a lock-out pin for the aforesaid clutch combination **93**, **96** and **99**. That is to say, in the "stop" position of the ball handle **125**, said lock-out pin **128** is disposed beneath a tangential extension **99***a* of the clutch spring thereby to hold the latter in a position such that it exercises no clutch-engaging function on the driving bushing **93**, and thus said bushing turns freely on the driving shaft **94**. However, when the ball handle is turned 90° in direction as to rest against the pin **127**, the clutch lock-out pin **128** is turned in its plane to a position in which it clears the spring extension **99***a*, whereupon the spring **99** operates to effect engagement of said clutch bushings **93**, **96**, and drive is transmitted to the chain-driving sprocket **67** via the shaft **94**. Conversely, turning of the ball handle **125** in the reverse direction against the "stop" pin **126** returns the clutch lock-out pin **128** to a position beneath the clutch spring extension **99***a*, as results in disengagement of the said clutch.

In addition to the aforesaid manual control, there is provided a supervisory control serving not only to deactivate the machine in the event the supply of zipper chain and fly-strip tape assembly runs out but also to prevent starting of the machine should there be no supply of zipper chain and tape assembly available to the machine. Again referring to FIGS. 1 and 2, such means illustratively comprises a collar-form disc **130** affixed to the lower end of the vertical control rod **124** and to which is affixed a biasing spring **131** serving, in the first instance, normally to position the ball handle **125** against the "stop" pin **126**. Said disc is provided in its peripheral surface with a V-notch **130***a* adapted to receive the pointed end of a solenoid-plunger **132***a*, which is spring-loaded so as normally to move against the disc, when said disc is turned (with the rod **124**) to the "start" position by movement of the ball handle **125** to that position, such arrangement providing that the plunger **132***a* will hold the disc, rod and ball handle in their respective "start" positions when said parts are manually turned to such position. However, energization of the solenoid **132** will result in retraction of its said plunger **132***a* and thereby release of the disc **130**, and thus it will be seen that whenever the solenoid is energized, said disc, the rod **124** and the ball handle **125** will return to the "stop" position under the bias of spring **131**.

According to the invention, energization of the solenoid **132** occurs only upon closing of a normally closed switch generally designated **134** mounted from a bracket **135** affixed to the feed-in side of the top plate **11**. Said switch incorporates a strip-material sensing arm **134***a* which, in its lowered position (in which it is held by the strip material moving over same), maintains said switch open. However, should the supply of the strip material become exhausted, the arm **134***a* raises to a switch-closing position, whereupon the solenoid **132** is energized and effects retraction of the solenoid plunger **132***a* from the notch **131**, as results in the disc, rod and ball handle

returning to their respective "stop" positions under the bias of the spring **131**. In the event no strip material is running over the switch arm **135** when the ball handle **125** is turned to the "start" position, said handle will similarly return to its "stop" position under the bias of disc-attached spring **131**, since under this condition the solenoid plunger **132***a* is in its retracted position in which it lacks disc-holding ability.

FIG. 2 also illustrates a preferred feed-in arrangement according to which the strip material, i.e. the zipper chain—fly strip tape assembly, is guided in its movement toward the strip-material supply sensing switch **134** by the outer looped end **138** of a guide rod whose inner or machine end is affixed to the aforesaid mounting block **26**. Another feature of convenience is that provided by a catch tray **140** for receiving the individual zipper lengths of chain and fly tapes severed from the continuous chain and fly tape assembly by the aforesaid cutting-off press **30**, it being observed that said tray or catch basket is supported beyond the forward or discharge side of the top plate **11** by a rod **141** whose inner end extends over the top plate and is affixed to the blade-mounting bracket **37**.

OPERATION

While it is believed that the operation of the apparatus as described in the foregoing will be understood by persons skilled in the particular art, it is briefly summarized as follows:

With the ball handle **125** in its "stop" position, one end of an indeterminate length of continuous "gapped" zipper chain and plural fly-strip assembly, faced and endwise disposed as illustrated in FIG. 11, is threaded through the outer looped end of the guide rod **138**, is thence drawn forwardly over the switch **134** which it deenergizes by its engagement with the switch arm **134***a*, and thence, by depression of the ball handle **28** which raises the hold-down bars **17**, **18**, is inserted between said bars and the guide strip **16** in position such that the chain of zipper or fastener elements FE seat in the guide-strip channel **16***a*, and further that the fly-strip tapes FT_1 and FT_2 are folded laterally outwardly from the zipper chain ZC proper, as in FIG. 12. Thereupon, the ball handle **28** is released, and the hold-down bars thereafter act to hold the chain-fly strip tape assembly in place on the guide strip **16**. The extent of the initial advancement of said chain-tape assembly along the guideway defined by the guide strip and hold-down bars will be such as to dispose the working end of the feed finger **42**, then in its most rearward position, in the most advanced zipper gap, into engagement with the correspondingly most advanced bottom stop BS. However, as previously explained, the aforesaid most rearward position of the feed finger **42** will be adjusted in accordance with the length of the closure-fly units to be severed and this adjustment is achieved by loosening of the bracket holding screw **58**, which releases the bracket **57** from the slide plate **59**, and sliding said bracket either back or forward along said plate as establishes the length of stroke of the feed finger, as will result in a feed increment of chain-tape assembly as in turn will yield the desired length of closure-fly unit. Upon the correct position of the bracket **57** having been established, it is held in that position along the guide plate **59** by the projection **60** upon retightening of the screw **58**.

While normally the line of cut made by the cutting-off press **30** is disposed equidistantly from the ends of each chain gap G presented to it, such is also subject to adjustment, thereby to increase or decrease the length of the element-free tape extension at the top and/or bottom ends of the severed closure-fly units (which the gaps G ultimately provide). This latter adjustment is effected by means of the set screws **62**, **62***a* whose turning in opposite directions effects limited adjustment of the feed-finger mounting bracket **43** with respect to the carriage-actuated shaft **44** to which said bracket is mounted.

Upon the aforesaid preliminary adjustments having been made, the apparatus is now placed in operation simply by manually actuating the ball handle **125** through a 90° turn to its "start" position, i.e. against the pin **127**, in which it is held by seating of the spring-biased solenoid plunger **132***a* in the notch of the disc **130**. As previously explained, turning of the control rod **124** by said ball handle effects engagement of the clutch elements **93**, **96**, whereupon drive is transmitted to the endless sprocket chain **64**. Up to this time, the carriage **46** has been held stationary in its retracted position by the bias of spring **77** acting through rod **74**, and the cutting-off press has been maintained deactivated by trip cam **105** and its biasing spring **116**. However, upon chain drive being initiated, the carriage **46** is moved forwardly by the chain via the aforesaid releasable driving connection therebetween, and actuates the feed finger throughout its forward stroke, as results in said finger advancing the zipper chain-fly strip assembly a distance corresponding to the length of the fly-closure unit to be severed from said assembly and to a position such that said length to be severed is disposed just forwardly of the cutting blade **36** of the cutting-off press **30**.

Upon the carriage **46** arriving at the limit of its forward motion, as determined by its engagement with the front-stop pin **54***a*, its forward motion is stopped, whereupon the releasable driving connection between chain and carriage "gives away" without interrupting continuous chain travel. The carriage is now actuated throughout its back or return travel, as effects return stroke of the feed finger, by said spring **77** acting through the rod **74**.

During the course of the return motion of the carriage, the chain attachment **120***a*, or **120**, which follows the carriage driving attachment **71***a*–**71***b* which has just released the carriage, engages the primary clutch release arm **118** of the means controlling engagement of the normally disengaged clutch **89** in the drive to the cutting-off press. Consequent to this engagement, drive to the press is initiated, as results in the press ram and its anvil **33** moving upwardly from their neutral position (in which the upper edge of said anvil is flush with the top surface of the top plate **11**—FIG. 4) against the lower edge of the pinking, i.e. cuting-off, blade **36**, thereby to cut off said most forward closure-unit length of zipper and fly-strip from the following continuous zipper chain, plural fly-strip assembly. Upon one single revolution of the press cam shaft **33** having been completed, the lock-out pawl **104** will reengage the cam step **105**, thereby disengaging the clutch **89** as results in the press ram and anvil being again disposed in the neutral position.

The above represents but a single cycle of operation of the herein apparatus, and it is to be understood that this cycle will be repeated over and over again until operation of the apparatus is stopped either by manually returning the ball handle **125** to its "stop" position against pin **126** or until the supply of zipper-fly strip tape assembly runs out, as will result in closing of the switch **134** and retraction of the solenoid plunger **132***a* from its holding engagement with the disc **130**.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. Apparatus for cutting off a succession of trouser-fly closure unit lengths of zipper chain and fly-strips assembled thereto from an indeterminate length of an assembly of continuous gapped zipper chain and continuous fly-strip tapes sewn thereto comprising, in combination: an upright stand including a top plate; zipper-chain guide and hold-down means for guiding said gapped zipper chain and fly-

strip tape assembly in a straight-line path of motion which extends generally across the upper surface of said top plate; a cutting-off means mounted to said top plate and being disposed astride said path of motion and in position as to sever individual closure-unit lengths of zipper chain and fly strips sewn thereto from the advancing end portion of said assembly traveling thereunder; means for intermittently feeding said gapped zipper chain and fly-strip assembly along said path of motion in increments of length corresponding to the length of the trouser-fly closure units being produced at any given time, said means including a reciprocatory feed finger mounted above said path of motion and being biased for movement into the gaps of the continuous zipper chain of the assembly as said gaps are successively disposed thereunder responsive to movement of said assembly along said path of motion and being operative on each forward stroke to abut the rearward closed end of each next forwardly disposed closure-unit length of zipper chain and thereupon to push the same and thereby said chain and fly-strip tape assembly forwardly a distance corresponding to the length of said stroke, and means for imparting reciprocatory motion to said finger including a powered endless chain and means for translating chain travel in uniform direction into forward and return motion of said finger; and means for translating chain travel as aforesaid into properly timed operation of said cutting-off means.

2. Apparatus according to claim 1, wherein the means for translating chain travel in uniform direction into forward and return motion of said finger also includes a reciprocatory carriage to which said finger is mounted, and a releasable driving connection between said endless chain and carriage, said connection being effective to drivingly connect the chain to the carriage upon the latter being disposed in a first stop position as in turn disposes the finger at the beginning of its assembly-feeding stroke and to disengage the chain from the carriage upon said carriage arriving at a second stop position as in turn disposes the feed finger at the end of its assembly-feeding stroke.

3. Apparatus according to claim 2, and further including means energized by the motion of the carriage when it is so connected to said driving chain and being operative upon release of said driving connection for effecting return travel of the carriage to its first position and thereby motion of the feed finger throughout its rearward stroke.

4. Apparatus according to claim 2, including means for pre-setting said first position of the carriage longitudinally along said path of motion thereby to adjust the extent of travel of the carriage and the length of the stroke of the feed finger to the length of the trouser-fly closure unit to be severed.

5. Apparatus according to claim 2, wherein said releasable driving connection comprises projecting means on the chain and retractible means on the carriage normally providing an abutment engageable by said projecting means but which retracts to an inactive position when forcibly pressed against by said projecting means, as occurs when said carriage arrives at said second stop position.

6. Apparatus according to claim 2, wherein said carriage has upwardly open channel configuration and said driving chain runs through the channel thereof, and wherein said releasable driving connection comprises laterally projecting attachments on the chain and retractible means mounted on said carriage in position to extend inwardly into said channel and thereby into the path of motion of said projecting means, said retractible means normally providing an abutment against which said projecting means engages and thereby transmits drive to the carriage from the chain but being capable of retracting and thereby releasing the chain from the carriage when forcibly pressed against by said projecting means, as occurs when said carriage arrives at its said second stop position.

7. Apparatus according to claim 1, wherein a common power source is drivingly connected to said chain and said cutting-off means by individual drive connections each including a normally disengaged clutch, wherein the clutch in the drive connection to said chain is manually engageable, and wherein the drive conection to the cutting-off means includes a normally inactive means for engaging the clutch in the driving connection thereto and said chain mounts means responsive to chain travel for rendering said last means active.

8. Apparatus according to claim 1, wherein the cutting-off means comprises a cutting-off press having a frame mounted in upside down relation to the under side of the top plate, a reciprocatory ram carried by said frame, a cutting anvil actuable by said ram upwardly from and downwardly to a neutral position in which its working end is flush with the upper surface of said top plate, and a cutting blade fixedly mounted to the top plate above the same and in position as to be struck by said cutting anvil during the course of its upward movement.

9. Apparatus according to claim 1, wherein the endless chain and the means for translating chain travel in uniform direction into forward and return motion of the feed finger and into properly timed actuation of said cutting-off means are mounted to and contained within the stand, and wherein said cutting-off means comprises a cutting-off press secured in upside down relation to the under face of the top plate of said stand and including a reciprocatory ram, a cutting anvil actuable by said ram upwardly from and downwardly to a neutral position in which its working end is flush with the upper surface of said top plate, and a cutting blade disposed above and fixedly mounted to the top plate in position as to be struck by said cutting anvil during the course of its upward movement, the construction and arrangement being such that the press proper is also contained within the stand.

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