Jan. 28, 1958 L. H. PLATT ET AL 2,821,055

FASTENING OF FLEXIBLE BAGS IN CLOSED CONDITION

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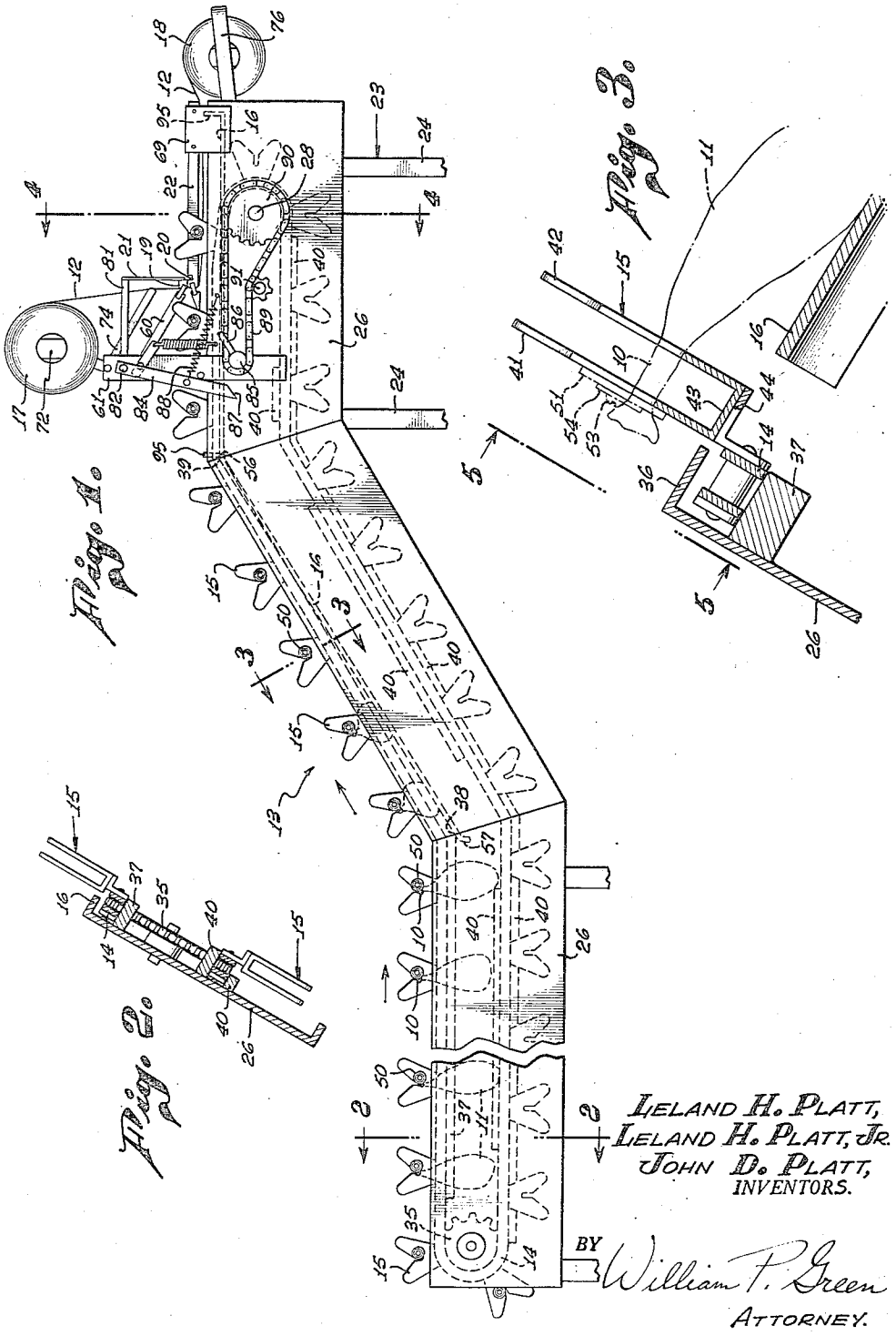


Fig. 1.

Fig. 3.

Fig. 2.

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Fig. 4.

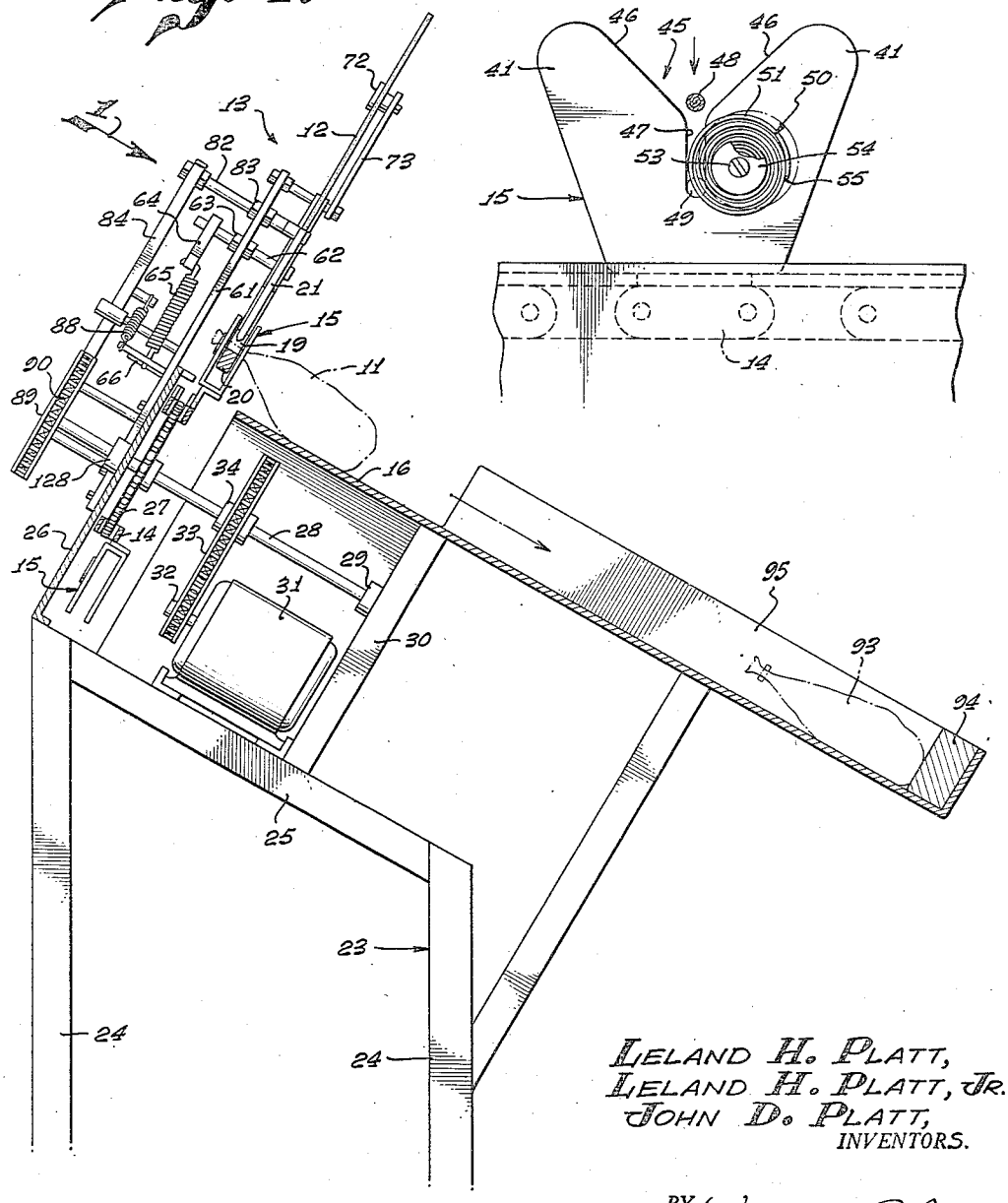


Fig. 5.

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Fig. 6.

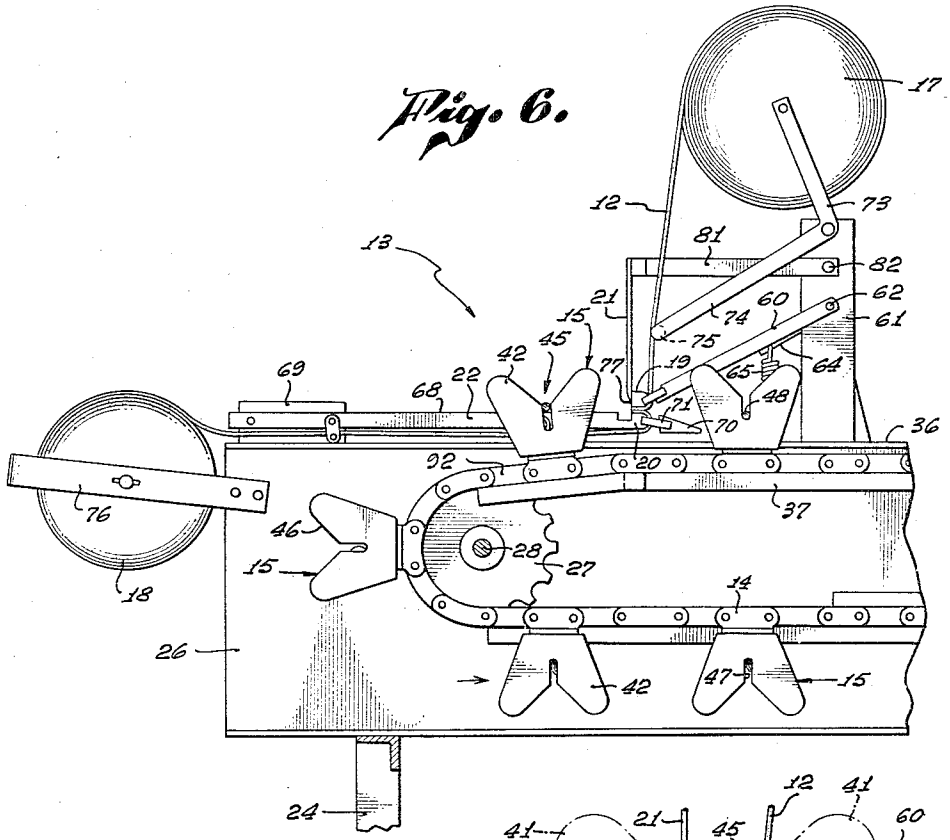


Fig. 7.

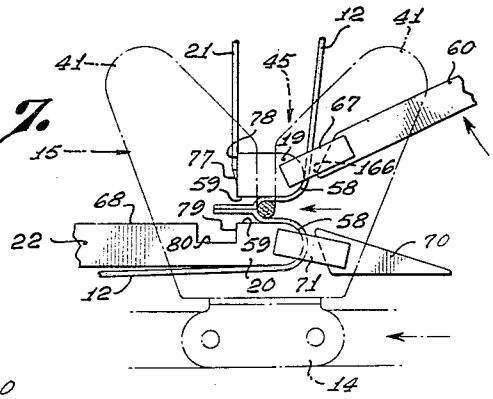
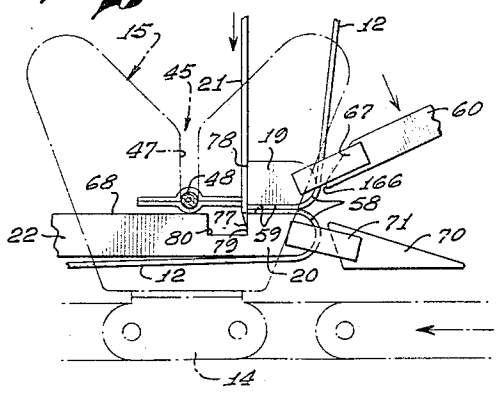


Fig. 8.



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United States Patent Office 2,821,055
Patented Jan. 28, 1958

2,821,055

FASTENING OF FLEXIBLE BAGS IN CLOSED CONDITION

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Application February 28, 1955, Serial No. 490,824

18 Claims. (Cl. 53—176)

This invention relates to improved apparatus for fastening flexible bags in closed condition. Certain features of the present apparatus have been disclosed and claimed in my copending application Number 417,382, filed March 19, 1954, on "Bag Closing Machine."

Apparatus embodying the invention is of a type adapted to apply fastening means to the gathered and closed neck portion of a flexible bag. For instance, the apparatus may be utilized for securing in closed condition bags containing any of various types of produce, the bags typically being formed of one of the currently very popular plastic materials, such as polyethylene. Preferably, the fastening is effected by applying about the necks of the bags a flexible adhesive tape, desirably of the pressure sensitive type adapted to adhere to an object in response to the application of a relatively light force against the tape.

A major object of the invention is to provide a bag fastening machine which is capable of fastening bags of widely varying sizes, and will do so without the necessity for adjusting any part of the apparatus to handle the different sizes. Further, the present apparatus is adapted to fasten a series of bags in very rapid succession and in a continuous type of operation.

A machine embodying the invention includes an endless conveyor which acts to move a series of bags successively past a fastening location, at which location the bag necks are secured in closed condition. For holding the bags on the conveyor, the latter preferably includes a series of units adapted to releasably hold the gathered or closed neck portions of the individual bags, and to then advance those neck portions past the fastening location. These holding units may act to at least partially suspend the weight of the bags and contents, with portions of the bags being received on and moved along a preferably inclined supporting apron located alongside the conveyor.

The neck holding units may comprise means forming individual throats into which the bag necks are insertible, to be held and advanced by the units. We find it highly desirable to incorporate in each of these units a yieldingly urged retaining member for holding a bag neck in the throat during movement of the conveyor and bag. Each of these retaining members may take the form of a spiral coil spring, which normally extends partially across the throat, and is laterally deflectible to pass a bag neck into the throat. For best operation, this spring should be mounted for rotation about its axis, to allow for a rolling engagement of the spring with the bag necks.

Along the path of the conveyor, there are provided means for securing the necks of the conveyor carried bags in their gathered and closed condition. These securing means may include a pair of pressure members, between which the necks and tape are passed, and which act to pressurally secure the tape to the necks. Beyond these pressure members, there may be provided a cutter, for cutting off the relatively short piece or pieces of tape that are applied to each individual bag. After the cutting operation, the bag neck may be automatically ejected from

the throat within which it has been held, preferably by engagement with a guide surface acting to progressively wedge the bag neck from the throat.

I find it most desirable to form each of the bag holding units to include two spaced elements (usually comprising two arms of a single U-shaped member), each of which elements or arms contains a throat for receiving the bag neck. The neck then extends between the two spaced elements, and the tape applying, tape cutting, and ejecting parts may be positioned to engage and act on the portion of the neck which is received between the holding elements.

The above and other features and objects of the present invention will be better understood from the following detailed description of the typical embodiment illustrated in the accompanying drawings, in which:

Fig. 1 is a side view of a bag fastening machine embodying the invention, and taken in the direction of the arrow designated in Fig. 4;

Figs. 2, 3 and 4 are enlarged transverse sections taken on lines 2—2, 3—3 and 4—4 respectively of Fig. 1;

Fig. 5 is an enlarged view of one of the bag holding elements of the device, taken along a line corresponding to that indicated at 5—5 in Fig. 3, and showing the neck portion of one of the bags as it is moved down into the holding element;

Fig. 6 is a fragmentary section through the apparatus, showing an end portion of the bag advancing conveyor;

Fig. 7 is a view showing the manner in which the tape is applied to the bag necks; and

Fig. 8 is a view similar to Fig. 7, but showing the manner in which the tape is cut after being applied to one of the bags.

The apparatus illustrated in the drawings is utilized for fastening in closed condition the gathered neck portions 10 of a series of filled bags 11. These bags 11 may be formed of any suitable flexible material, such as the thin plastic material (usually polyethylene) which is currently being used for packing carrots and various other types of produce. The machine acts to apply to the necks of such bags a pressure sensitive adhesive tape 12, which then very effectively holds the bag necks in closed condition.

The apparatus 13 for fastening the bags in closed condition includes an elongated endless chain or conveyor 14, which carries a series of bag holding elements 15. An operator manually gathers the necks of the bags, and attaches them to the various elements 15, to be suspended by those elements and advance therewith to the right as seen in Fig. 1. The bags 11 whose necks are held by elements 15 extend downwardly at an angle upon the upper surface of an apron or support member 16, which acts to partially support the weight of the bags and their contents as they are moved toward the tape applying mechanism. The tape is applied to the bags from two supply rolls 17 and 18, and is caused to secure the bag necks in closed condition by passing the tape and necks between a pair of pressure members 19 and 20. Short pieces of tape applied to each neck are cut off from the rest of the tape by means of a cutter element 21, following which the bags are automatically wedged out of the gripping units 15 by means of a wedge or guide element 22, typically being a portion of the same part that forms the lower pressure member 20.

The apparatus is supported on a rigid stationary frame 23, which may include a number of vertically extending legs 24 having inclined frame elements 25 extending between and interconnecting their upper ends. The frame also includes various other rigid frame members provided at suitable locations for mounting the various parts of the apparatus. The conveyor chain 14 is movably carried by an inclined rear plate 26, which extends up-

wardly at an angle from the upper ends of the rear legs 24.

One end of the chain extends about and is driven by a first sprocket wheel 27, which is carried by a shaft 28 journaled in a bearing 128 attached to plate 26, and in a bearing 29 attached to a frame member 30. This shaft 28 is continuously rotatably driven by a frame mounted electric motor 31, through a sprocket wheel 32 on the motor shaft, a chain 33, and a sprocket wheel 34 on shaft 28. The opposite end of chain 14 extends about an idler sprocket wheel 35 mounted to an opposite end of the frame. Motor 31 runs in a direction to advance the upper run of chain 14, and the carried bag holding elements 15, to the right as seen in Fig. 1.

In moving from sprocket wheel 35 to sprocket wheel 27, chain 14 is directed along a non-linear path, by confinement of the chain within a guide channel or recess formed by and between an upper turned flange 36 of plate 26, and an elongated guide member 37 extending in parallel spaced relation to flange 36. As will be apparent from Fig. 1, these guide elements 36 and 37 direct the upper run of chain 14 first horizontally to a point 38, then at an inclination upwardly to a point 39, and then horizontally again at a raised elevation to sprocket wheel 27. The lower or return run of chain 14 extends essentially parallel to the upper run, being directed by a number of guide elements 40.

Each of the elements 15 for holding the bags takes the form of a U-shaped member formed of rigid sheet metal or the like, and having two preferably identically shaped spaced parallel generally upwardly extending arms 41 and 42. The lower transverse portion 43 of each element 15 is suitably attached in fixed relation to one of the links of chain 14, as for instance by means of an angle bracket 44 which may be welded to element 15 and riveted to the chain link. Elements 15 are thus positively held by the chain in the illustrated upwardly projecting positions during the rightward movement of elements 15 as seen in Fig. 1.

The two arms 41 and 42 of each element 15 have upwardly opening throats or recesses 45, which are desirably of identical configuration. These throats 45 may have upper portions 46 of progressively decreasing width (downwardly), and may have lower portions 47 of substantially uniform width. An operator gathers the neck portion 48 of one of the bags 15, as to the closed condition illustrated in Fig. 5, and forces that closed neck downwardly within the throats 45 of one of the units 15, to the position illustrated at 49 in Fig. 5. The upper converging portions 46 of throats 45 serve to effect part of the neck closing action by virtue of the downward movement of the neck within the throats.

The closed neck is held in the position illustrated at 49 in Fig. 5 by means of a yielding gripping unit 50, which is mounted to the rear side of the arm 41 of element 15. Gripping unit 50 comprises a coil spring 51 formed of flat spring steel, and having a spiral configuration, with all of the turns of the spring desirably being in alignment (i. e., one within the other) transversely of the axis of the spring. The innermost turn of spring 51 forms a central opening within the spring, through which there extends a screw or pin 53 attached to arm 41 of element 15. The spring 51 is free for rotation about screw 53, and is held against arm 41 by a washer 54 received beneath the outer head of screw 53. The outer end of spring 51 may be attached in fixed relation to the next inner turn, as by welding at 55, so that the outer portion of the spring has a substantially continuous radially outwardly facing surface serving essentially as an outer ring on the spring.

In its normal condition, spring 51 extends substantially entirely across the lower uniform width portion 47 of the adjacent throat 45 (see Fig. 5 full line position). When the neck portion 48 of one of the bags is forced downwardly within throats 45, spring 51 is deflected laterally, to pass the bag neck, and the spring then resiliently returns inwardly and partially across the throat, as to the broken line position of Fig. 5. In this Fig. 5 broken line position, a spring yieldingly holds the bag neck 48 in the position indicated at 49, in which position the bag is very effectively and positively supported from element 15. As the neck 48 is moved into and out of throats 45, springs 51 turns freely about screw 53, to thus facilitate the insertion and removal of the bag neck. The screw 53, and consequently the rotary axis of spring 51, preferably extend directly perpendicular to the sheet metal forming arms 41 and 42 of element 15.

As will be apparent from Figs. 1 to 4, the apron or support 16 for partially supporting the weight of the bags as they are advanced toward the tape applying mechanism, extends at an inclination downwardly and outwardly from a location adjacent the upper run of chain 14. Apron 16 may be formed of rigid sheet metal, having an edge portion adjacent and essentially following the path of the chain, this edge extending from a point 57 angularly upwardly to a point 56, and then horizontally along the upper horizontal portion of the chain to the end of the machine. Until the bags reach point 57, they hang essentially directly downwardly from holders 15, and at point 57 the apron has a downturned portion which deflects the bags upwardly onto the apron to follow the apron from that point on. As will be apparent from Figs. 3 and 4, both the portion of the chain between points 57 and 56, and the portion of the chain beyond point 56, are inclined downwardly and outwardly away from the chain.

After the bags pass location 39, and commence to move horizontally at an elevated location, the bag holding elements 15 move past the location of pressure members 19 and 20 for applying the tape to the bags. These two pressure members 19 and 20 are narrow enough to be received between the two arms 41 and 42 of the elements 15, so that the pressure members may apply the tape to the portions of the bag necks received between those two arms. Each of the pressure members 19 and 20 has a forward surface 58 which is of the illustrated rounded configuration in vertical section. Beyond these rounded leading edges 58, the pressure members 19 and 20 have opposed parallel horizontal pressing surfaces 59 between which the two tapes 12 and the bag necks pass. The tapes 58 are directed around the leading rounded edges 58 of the pressure members, and then pass between the pressure members with the adhesive surfaces of the two tapes in engagement. These tapes are of a known "pressure sensitive" type adapted to adhere tightly together when pressed together, as by the two pressure members 19 and 20. As one of the necks of a bag held by an element 15 is moved horizontally by that element, the neck moves directly toward the space between pressure members 19 and 20, and then acts to engage the two tapes 12, and advance with the tapes between the pressure members so that the tapes are permanently secured to the neck (see Fig. 7). The pressure members act to press the two tapes 12 directly together both ahead of and behind each bag neck (see Fig. 8).

The lower pressure member 20 is rigidly and stationarily attached to the frame of the apparatus. The upper pressure member 19 is mounted to be deflected upwardly as the neck of one of the bags passes between the pressure members, the upwardly deflected position being illustrated in Fig. 7. To mount pressure member 19 for such upward swinging movement, this pressure member is carried by an arm 60, which is pivotally attached to an upstanding frame element 61 by means of a horizontal shaft 62. Arm 60 is rigidly attached to shaft 62, which is mounted for its rotary or pivotal movement by means of a bearing 63 carried by element 61, with the opposite end of shaft 62 being rigidly attached to an arm

64 which is yieldingly urged downwardly by a spring 65 attached to a frame carried pin 66. As will be apparent, spring 65 yieldingly urges arm 60 and the carried pressure member 19 downwardly toward stationary member 20. Pressure member 19 may be spaced a short distance from the outer end of arm 60, as at 166, to allow passage of one of the tapes 12 downwardly between elements 19 and 60. Pressure member 19 may be attached to arm 60 by means of a pair of parallel attaching straps or members 67 at opposite sides of elements 19 and 60. These straps 67 of course attach element 19 in fixed relation to arm 60.

Stationary pressure member 20 may be the outer end portion of a rigid member 22, whose upper directly horizontal surface 68 acts to wedge the bag necks upwardly out of holding units 15 after the closing operation has been completed. This member 22 may be rigidly attached to the frame of the apparatus in any suitable way, as by attachment at an outer end to an upwardly extending frame carried member 69. The stationary pressure member 20 may carry a wedge shaped guide element 70, typically attached to element 20 by a pair of straps 71 corresponding to the previously described straps 67. The opposed surfaces of elements 70 and 60 desirably converge toward the space between the two pressure elements 19 and 20, to facilitate in directing the advancing neck portions of the bags toward the proper location for movement between elements 19 and 20.

The upper tape roll 17 is rotatably mounted on a hub 72 carried by an arm 73 which is fixedly attached to and projects upwardly from frame element 61. The member forming arm 73 may have a second arm portion 74 carrying a guide portion 75 past which tape 12 from the upper roll is directed. The tape from this upper roll 17 extends downwardly through the passage 66 formed between elements 19 and 60, and then curves inwardly beneath element 19. The second tape roll 18 may be rotatably mounted to a member 76, which is suitably attached to the frame. The tape from roll 18 extends horizontally beneath member 22 and upwardly between elements 20 and 70 and about the leading curved face 58 of stationary pressure member 20, to return along the upper surface of element 20.

The cutter member 21 is a vertically extending element having a sharp lower cutting edge 77, which is adapted to move downwardly alongside the rear vertical faces 78 and 79 of the two pressure members 19 and 20, to thus cut off the tape held between the pressure members. To provide the rear vertical face 79 on pressure member 20, the part forming this member contains an upwardly opening recess 80 just beyond the location of the movable pressure member 19. Cutter 21 is carried and actuated by a swinging arm 81, which in turn is carried and actuated by a shaft 82 journaled in a bearing 83 in frame element 61. At an opposite end, shaft 82 is rigidly attached to an actuating arm 84, whose deflection to the left as seen in Fig. 1 acts through shaft 82 and arm 81 to move cutter 21 downwardly to effect a tape cutting action. Cutter 21 is formed of a resiliently flexible spring steel, which is capable of bending slightly as the cutters move downwardly, to maintain the cutter in proper engagement with surfaces 78 and 79 in spite of the fact that the cutter is actually swinging about the axis of shaft 82.

Arm 84 is actuated in a cutting direction once during each revolution of a time control member 85. This control member 85 may be a sprocket wheel carrying an essentially radially projecting lug 86 adapted to engage upwardly against an angular cam face 87 at the lower end of arm 84, to deflect arm 84 to the left for effecting a cutting operation. Arm 84 may be returned to the right as seen in Fig. 1 by a spring 88 attached at opposite ends to arm 84 and the frame. Sprocket wheel 85 is driven in a clockwise direction as seen in Fig. 1 by a chain 89 driven by a sprocket wheel 90 carried by the continuously rotating shaft 28. Chain 89 may also pass and mesh with an idler wheel or guide wheel 91. As will be apparent, sprockets 85 and 90 must be of such relative sizes that element 86 will make exactly one revolution, and therefore effect one cutting operation, in the same time that the bag holding units 15 advance a distance equal to the spacing between the successive units 15 on the chain.

In order to effect the ejection of the fastened bags from elements 15 after the taping and cutting operations, chain 14 has a final portion at 92 which extends at a slight angle downwardly (say about 10 degrees), and which therefore extends at a corresponding angle to the upper directly horizontal surface 68 of member 22, so that surface 68 serves to progressively wedge or cam the closed neck of each bag upwardly relative to the associated holding unit 15, to thus move the bag neck out of the throats 45 of that unit before that unit commences to move abruptly downwardly at the end of the upper run of the conveyor. For allowing such slight downward movement of the chain and elements 15 at 92, the final portion of the previously mentioned guide element 37 which supports the chain is directed downwardly at a slight angle relative to the adjacent horizontal portion of that guide element. When the neck of a bag is thus ejected upwardly from the throat 45 of one of the holding units 15, the bag is freed to slide downwardly along the upper inclined surface of apron 16 and to the position indicated at 93 in Fig. 4. A stop member 94 may extend across the lower edge of apron 16 at that location, to hold the bag in the illustrated position 93. Also, two parallel retaining walls or flanges 95 may extend upwardly along apron 16 from its lower edge to laterally define the location 93, from which an operator removes the closed bags.

To now describe the operation of the apparatus, an operator stands at the location in front of the left end portion of apron 16, as seen in Fig. 1. This operator successively picks up individual filled bags 11, gathers or closes the neck portions 48 of those bags, and forces the neck of each downwardly into the throats 45 of the two arms 41 and 42 of one of the holding elements 15. This neck thus bridges the space between the two arms 41 and 42 of the element 15. As the bag neck is moved downwardly past spring 51, the spring turns and is deflected laterally and then acts to yieldingly grip the bag neck and positively hold it in the throat in a manner supporting the bag from the element 15. The lower portion of the bag is of course supported by and moves along the apron 16.

As the elements 15 carried by the upper run of chain 14 move to the right, they move the suspended bags 11 with them along apron 16. During the angularly upward movement of elements 15 between points 38 and 39, the weight of the filled bags causes the bags to roll downwardly along apron 16 a short distance relative to the associated holding units 15, thus giving a slight twist to the gathered necks of the bags in a manner tending to assure that the necks will be properly gathered and closed. After each bag reaches point 39, it again moves horizontally, and the portion of the bag neck between the two arms 41 and 42 of element 15 then advances through the converging throat formed by elements 60 and 70, and to a position of engagement with the two tapes 12 at substantially the location at which the tapes engage. The previous closing operation of course has advanced leading portions of the tapes to the positions of Fig. 6 between pressure members 19 and 20, so that the engaging adhesive carrying faces of these leading portions of the tapes are effectively secured together. Further advancement of the bag neck causes the neck and engaged tapes to advance together through the space between pressure members 19 and 20, with the former being deflected upwardly to allow passage of the enlargement formed by the bag neck (see Fig. 7). As the neck thus advances between the pressure members, the spring 65 urges these

members relatively together, to cause the pressure sensitive tape to adhere tightly to the bag neck. After the neck has passed pressure member **19**, the latter moves downwardly to its Fig. 8 position, to press together the portions of the tapes directly following the bag neck, so that the tapes are attached directly together both ahead of and behind the neck. When the neck and tape reach the Fig. 8 position, lug **86** on sprocket wheel **85** engages the angular face **87** of arm **84**, to swing that arm as well as arm **81** and cutter **21** about the axis of shaft **82**, and thus cause cutter **21** to move downwardly to the Fig. 8 position and cut off the portion of the tape which has been applied to the neck being considered. After the cutting operation, spring **88** of course returns the cutter to its normal upwardly retracted position to allow for advancement of the next successive bag neck and applied tape between the pressure members and past the cutting location.

As the fastened bag moves beyond the cutting location, the slight downward movement of the carrying element **15** at **92** causes the upper horizontal surface **68** of member **22** to progressively wedge or cam the closed bag neck upwardly (as seen in Fig. 6) past spring **51** and out of throats **45** of element **15**. The closed bag falls downwardly to the position illustrated at **93** in Fig. 4, from which location an operator successively removes the bags. As will be apparent, the parts **19, 20, 22, 60, 70**, as well as straps **67** and **71**, form units which are all sufficiently narrow transversely of the direction of chain movement to allow these parts to be received between the two arms **41** and **42** of the various bag holding units **15**, as the latter move past the tape applying, tape cutting, and bag ejecting locations.

We claim:

1. Apparatus for securing filled flexible bags in closed condition comprising an endless bag advancing conveyor moving along an endless path, said conveyor having a series of units moving therewith along said endless path and adapted to grip and advance closed neck portions of said bags, and means along said path operating to fasten closed said neck portions held by said units, each of said units comprising means forming a throat into which the neck portion of one of said bags is movable essentially transversely of said neck, and a releasable holding element movable relative to the throat and operable to releasably retain a bag neck in said throat.

2. Apparatus as recited in claim 1, including means mounting said holding element for rotary movement in a position of extension partially across said throat, said holding element being resiliently deflectible transversely of its axis of rotation to allow movement of a bag neck into the throat past the holding element.

3. Apparatus as recited in claim 1, in which said holding element includes a spiral coil spring adapted to be deflected generally transversely of its axis by a bag neck as the neck is moved into said throat.

4. Apparatus as recited in claim 3, including means mounting said spring for rotation about an axis extending generally parallel to the direction in which a bag neck extends through said throat.

5. Apparatus as recited in claim 3, including means securing an outer end of said spiral spring in fixed relation to an adjacent portion of the next inner turn of said spring.

6. Apparatus as recited in claim 1, in which said throat has an entrance portion of progressively decreasing width, and an inner portion of essentially uniform width across a portion of which said holding element extends.

7. Apparatus for securing filled flexible bags in closed condition comprising an endless bag advancing conveyor moving along an endless path, said conveyor having a series of units moving therewith along said endless path and adapted to grip and advance closed neck portions of said bags, and means along said path operating to fasten closed said neck portions held by said units, each of said units including two bag holding elements spaced apart transversely of the direction of advancement thereof along said path, said spaced elements containing throats for receiving a bag neck with the neck extending between said elements, and said fastening means including means positioned to be received between said elements as they advance along said path and to act on the portion of the bag neck extending between the elements.

8. Apparatus as recited in claim 7, in which said fastening means include means for feeding pressure sensitive tape to a location between said elements, and a pair of pressure members received between said elements as they advance and between which the tape and neck are advanced to secure the neck closed by the tape.

9. Apparatus as recited in claim 8, including a cutter received between said elements and acting to cut off the tape applied to each bag neck by said pressure members.

10. Apparatus as recited in claim 9, including a spiral coil spring rotatably attached to one of said elements and extending partially across the throat therein to yieldingly retain the bag neck in said throats.

11. Apparatus for securing filled flexible bags in closed condition comprising an endless bag advancing conveyor moving along an endless path, said conveyor having a series of units moving therewith along said endless path and adapted to grip and advance closed neck portions of said bags, and means along said path operating to fasten closed said neck portions held by said units, each of said units comprising means forming a throat into which the neck portion of one of said bags is movable essentially transversely of said neck, and a releasable holding element movable relative to the throat and operable to releasably retain a bag neck in said throat, said means for fastening the necks closed including two pressure members forming a yielding restriction through which said necks are forced, and means for supplying adhesive tape to said necks at a location to be pressed thereagainst by said pressure members and hold the necks closed, said units being movable with said conveyor past said pressure members in close proximity thereto to force the necks through said restriction.

12. Apparatus as recited in claim 11, in which said throats of said units open transversely of the direction of endless advancement of the units.

13. Apparatus as recited in claim 11, including an inclined support extending at an inclination downwardly from a location adjacent the path of said units and along which the bags move in inclined condition as the units advance the neck portions thereof.

14. Apparatus as recited in claim 11, including a guide member acting to engage the fastened neck portions beyond said pressure members and wedge the neck portions out of said throats as a result of said advancement.

15. Apparatus as recited in claim 14, in which said conveyor has a portion beyond said fastening means advancing along a path disposed at an angle to said member and to the path in advance of said fastening means to effect said wedging action.

16. Apparatus as recited in claim 11, in which one of said pressure members is movable toward and away from the other, there being a spring yieldingly urging said one member toward the other to press the tape against the bag necks.

17. Apparatus as recited in claim 11, including a cutter beyond said pressure members for cutting off the tape applied to each neck from a supply thereof.

18. Apparatus as recited in claim 1, in which said holding element is spring urged into bag retaining position when a bag neck is in the throat.

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