

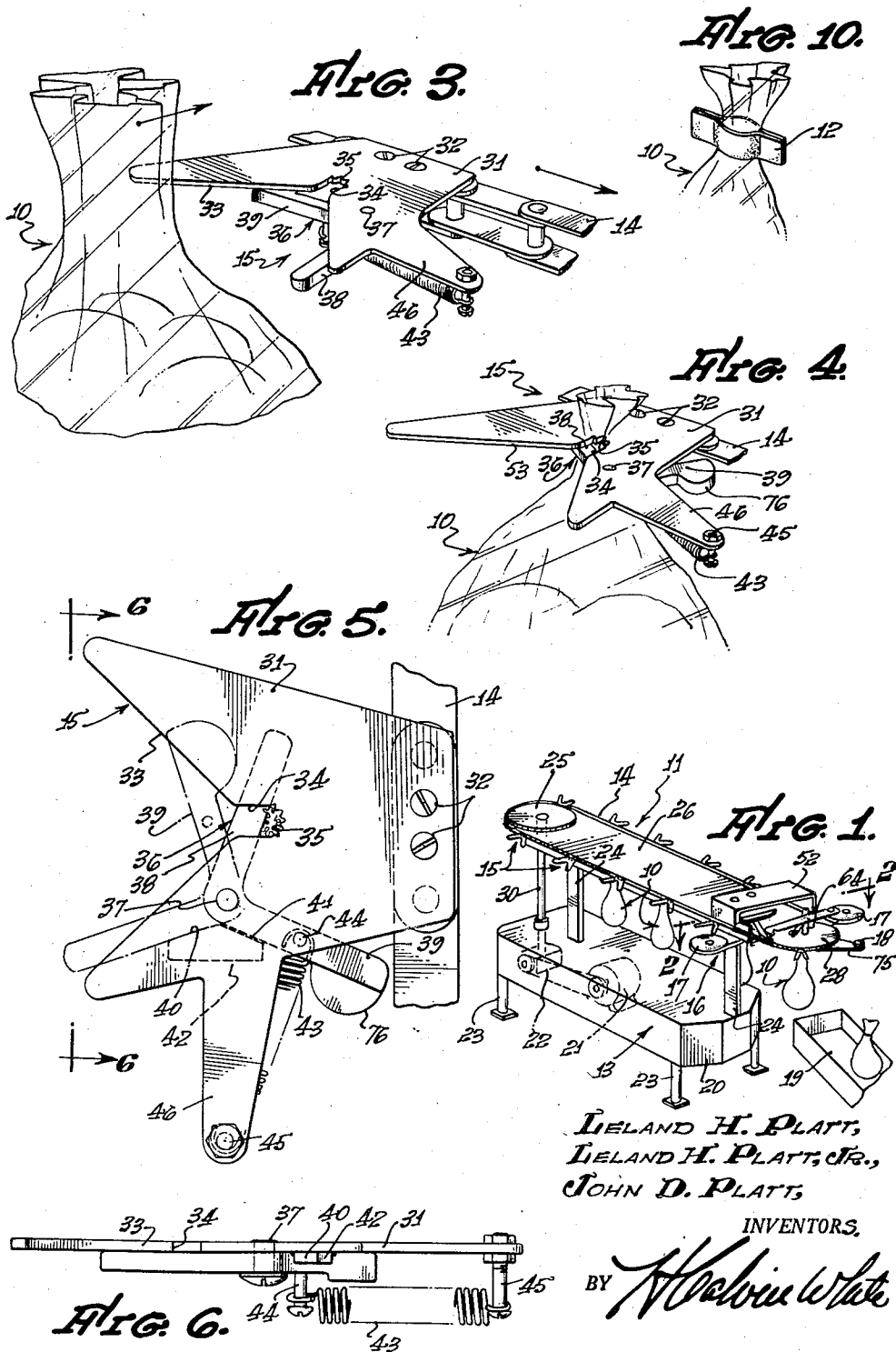
Jan. 6, 1959

L. H. PLATT ET AL
BAG CLOSING APPARATUS

2,867,066

Filed Dec. 12, 1955

2 Sheets-Sheet 1



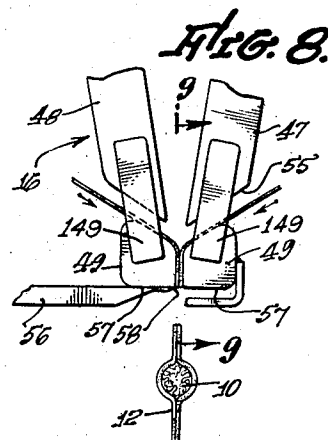
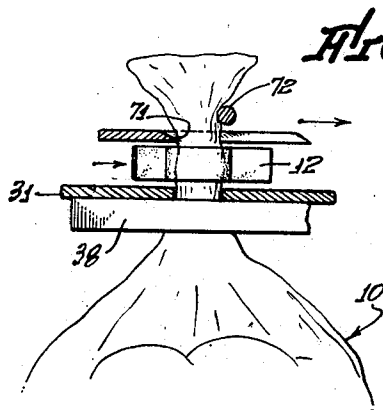
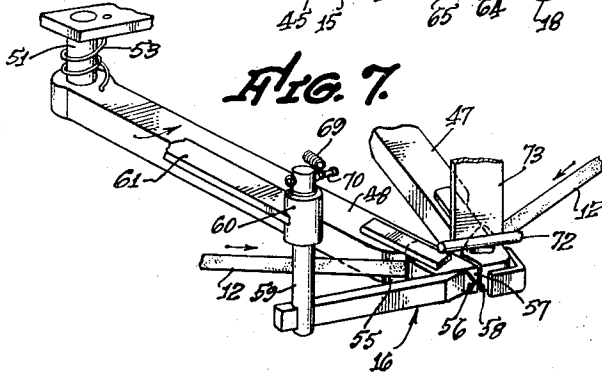
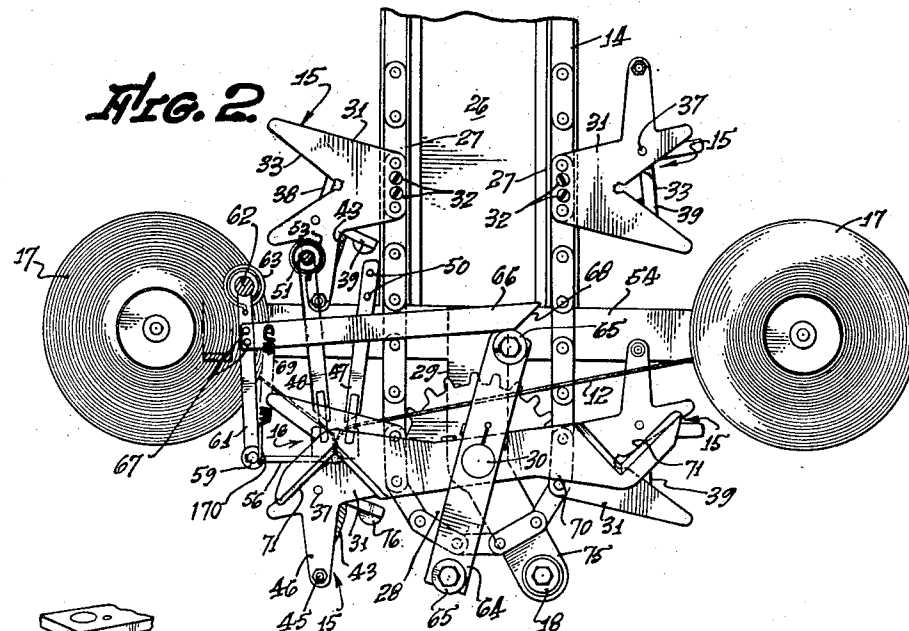
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2,867,066

BAG CLOSING APPARATUS

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Application December 12, 1955, Serial No. 552,629

10 Claims. (Cl. 53—198)

This invention relates to improved apparatus for fastening flexible bags in closed condition.

In our copending applications Serial No. 417,382, filed March 19, 1954, now Patent No. 2,840,967, entitled "Bag Closing Machine" and Serial No. 490,824, filed February 28, 1955, now Patent No. 2,821,055, entitled "Fastening of Flexible Bags in Closed Condition," we have disclosed a unique type of machine for fastening flexible bags in closed condition, by applying pressure sensitive tapes to the gathered necks of the bags. This invention constitutes an improvement on the disclosures of these prior applications, and is particularly concerned with the type of apparatus shown in the second of the two applications. In that case, the bag closing apparatus includes an endless conveyor having a series of gripping units which hold the gathered necks of a series of bags, and advance the necks successively along an endless path past a fastening or taping mechanism. The present invention is in certain of its aspects especially concerned with an improved manner of formation of the gripping units in such an arrangement.

In accordance with the invention, each of the gripping units includes a member or structure forming a tapering throat into which the neck of a bag may be inserted in a gathered condition. The throat progressively narrows toward an inner end portion of the throat, within which the bag neck is positively held during the fastening operation.

A particular feature of the invention has to do with the provision in each of the gripping units of a holding element which acts to automatically assist the operator in gathering or closing a bag neck as it is moved into one of the throats, and which then functions to tightly retain the gathered neck in the throat during the fastening operation. As a result of the gathering effect of this element, an operator does not have to tightly pre-gather the neck, but need only partially gather it and then advance it in rather loose condition into the throat. The holding element referred to will then act to automatically crowd or force the entire neck portion of the bag into the throat in a very tightly gathered condition.

Structurally, the holding element is constructed to extend across the throat and to swing inwardly toward the reduced end of the throat behind the neck of one of the bags. The element may be automatically actuable in a gathering direction by the initial manual movement of the bag neck itself, this actuation typically being effected by forming the holding element to have an actuating arm which is adapted to be engaged and deflected by a leading portion of the bag neck. The holding element is preferably mounted for swinging movement with respect to the associated throat, and may be spring urged by an overcenter spring adapted to urge the element toward either its active or released position. The element may subsequently be automatically released by engagement with a releasing part after the fastening operation has been completed.

As for the fastening operation itself, this is effected

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by advancing the gathered bag neck, together with a suitable pressure sensitive tape, through a restriction formed by a pair of relatively deflectible pressure members. These pressure members serve to apply the tape to the bag neck, following which the applied portion of the tape may be automatically cut off from a main supply roll or rolls of the tape. As the neck passes between the pressure members, the neck may be urged in the advancing direction by forces exerted simultaneously both above and beneath the pressure members. The force at one of these locations is exerted by one of the gripping units, while the force at the other location is desirably exerted by an auxiliary bag advancing part. This part may be a swinging arm, typically having a notch within which the neck is received, and suitably timed to successively swing into engagement with the various bag necks as they successively reach the fastening location.

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 perspective view of a bag closing machine constructed in accordance with the invention;

Fig. 2 is an enlarged fragmentary horizontal section through an end portion of the Fig. 1 machine, and taken on line 2—2 of Fig. 1;

Fig. 3 is a further enlarged fragmentary view showing one of the bag gripping units, the unit being shown in a released condition prior to insertion of a bag into a unit;

Fig. 4 is a view corresponding to Fig. 3 but showing the gripping unit in its active bag holding condition;

Fig. 5 is a plan view of one of the gripping units;

Fig. 6 is a view taken along line 6—6 of Fig. 5;

Fig. 7 is a fragmentary perspective view of a portion of the tape applying mechanism;

Fig. 8 is a top view of an end portion of the mechanism shown in Fig. 7;

Fig. 9 is a vertical section taken on line 9—9 of Fig. 8; and

Fig. 10 is a fragmentary perspective view of one of the bags shown in its final taped condition.

In the drawings, the bags which are to be fastened closed are represented at 10, and may be formed of thin flexible plastic material, such as the polyethylene sheet material which is commonly used for packaging various types of produce and the like. These bags are manually fed to the machine 11 in filled condition, and with the upper neck portions of the bags in a partially gathered or closed condition such as that shown in Fig. 3, and the machine then functions to complete the gathering of the bag neck and apply pressure sensitive tape 12 to the neck to hold it in the final closed condition of Fig. 10.

As seen best in the general view of Fig. 1, the machine 11 includes a main stationary frame structure 13, to which there is movably mounted an endless horizontally extending conveyor or chain 14. Chain 14 carries a series of spaced bag holding units 15, into which an operator successively inserts the necks of the various bags which are to be closed. Units 15 then act to suspend the bags and advance them along the endless path of conveyor 14, to first move the bags successively past a taping location 16 at which the tape 12 is applied to the bag necks from a pair of supply rolls 17, following which the taped bags are advanced to a location at which they are released from the gripping units by engagement of the gripping units with a releasing roller 18. The closed bags may fall from this releasing position into a suitable receptacle 19.

The frame structure 13 may include a lower housing

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portion 20 containing a drive motor 21 driving a reduction gear unit 22, which in turn continuously drives the endless conveyor 14. Housing portion 20 of the frame may be supported on suitable legs 23, and rigidly carries a pair of spaced upwardly projecting support members 24 which mount the conveyor 14 and other associated portions of the apparatus.

As will be apparent from Figs. 1 and 2, the endless chain 14 is mounted for endless movement along an elongated horizontal path by means of a pair of sprocket wheels 25 and 28 which engage opposite ends of the chain and are mounted for rotation about spaced vertical axes. Between sprocket wheels 25 and 28, the chain 14 is supported on and moves along the upper surface of a horizontal rigid plate 26, which is rigidly attached to the two supporting posts 24 of the frame. The two straight runs of chain 14 may be backed up against movement relatively together by means of a pair of straight backing elements or tracks 27 which are attached to and project upwardly from plate 26. The two sprocket wheels 25 and 28 are journaled for rotation about their spaced vertical axes by bearings attached in any suitable manner to opposite ends of stationary plate 26. For instance, as seen in Fig. 2, the bearing for mounting sprocket wheel 28 may be attached to an arm 29 projecting from the end of plate 26. Sprocket wheel 25 may be mounted in similar fashion, and is continuously driven by a vertical shaft 30 projecting upwardly from power driven gear unit 22, the drive being in such a direction as to advance chain 14 in a counter-clockwise direction as seen in Figs. 1 and 2.

The untaped bags are connected into gripping units 15 at any convenient location in advance of the taping location. As best seen in Figs. 2 to 6, each of these gripping units includes a rigid horizontally extending preferably sheet metal plate 31, which is rigidly attached to one of the links of chain 14, as by means of a pair of screws or other fasteners 32. This plate member 31 projects laterally outwardly from the chain, and increases in horizontal width as it projects outwardly. Extending inwardly toward the chain from the outer end of each of the members 31, that member contains a tapering throat 33 into which the partially gathered neck of a bag 10 can be inserted. Throat 33 progressively decreases in width toward an inner end portion 34 of the throat, which inner end portion may be of a uniform width which is sufficiently small to hold the bag neck in a completely gathered or closed condition (see Fig. 5). The inner end portion 34 of the throat preferably terminates inwardly in a toothed essentially arcuate end wall 35.

The bag neck is tightly gathered and held within the inner end of throat 33 by means of a swinging holding part 36, which is movably pivoted at 37 to the underside of plate 31 for swinging movement relative to plate 31 about a vertical axis. Holding part 36 has two angularly disposed arms 38 and 39 which extend and swing along the underside of member 31. These arms swing about axis 37 between the broken line released position of Fig. 5 (corresponding to the Fig. 3 position), and the full line bag holding position of Fig. 5 (corresponding to Fig. 4). The swinging movement of member 36 and its two arms 38 and 39 is limited at these two positions by engagement of the arms with a pair of angular faces 40 and 41 on a stop member 42 rigidly attached to the underside of plate 31. Member 36 is adapted to be yieldingly retained in or urged toward either of these two positions of Fig. 5 by means of an over-center coil spring 43, whose opposite ends are attached respectively to a pin 44 on arm 33 and a pin 45 projecting downwardly from an ear 46 which extends laterally from and is fixed relative to plate 31. As is best brought out in Fig. 5, element 36 does not swing as far past the center post of spring 43 in the releasing direction as in the grip-

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ping direction, and as a result the force holding element 36 in its bag gripping position of Fig. 4 is considerably greater than the spring force holding element 36 in its released position of Fig. 3.

In the released position of member 36, arm 38 is swung to a position in which it does not extend across the throat 33, but allows movement of a partially gathered bag neck into the throat ahead of arm 38. In the same position of element 36, arm 39 is disposed directly across throat 33 and in the path of the bag neck, so that as an operator moves the neck of a bag into the throat and toward its inner reduced end 34, the bag serves to deflect arm 39 inwardly of the throat and past the center position of spring 43. Once element 36 has passed that center position this part rapidly swings under the influence of spring 43 to the full line bag holding position of Fig. 5, so that arm 38 of element 36 positively displaces the entire neck into the inner end of the throat and to the condition shown in Figs. 4 and 5. Thus, arm 38 serves to complete the gathering or closing of the partially gathered bag neck, and then effectively hold the completely gathered neck in the inner end of the throat during the taping operation. The force of spring 43 is of course sufficient to suspend the bag and its contents from the gripping unit when element 36 is in the Fig. 5 position.

After each of the bags is thus connected into one of the gripping units 15, the gripping unit and bag are advanced past the taping location 16, which is preferably adjacent one side of sprocket wheel 38. At the taping location, the bag neck is advanced horizontally between a pair of pressure members 47 and 48, which form a yieldingly expansible restriction acting to apply the tape 12 to the neck. The two pressure members 47 and 48 may be horizontally elongated, as shown, and progressively converge in the direction of bag movement toward their proximate active ends 49 which actually exert the tape applying force. One of the pressure members 47 is desirably stationarily mounted to the frame structure, as by attachment at 50 to plate 26. The other pressure member is pivotally mounted at its outer end to a vertical pin 51 which projects downwardly from a transverse upper plate 52 which is stationarily mounted to and spaced above plate 26. The pivotal mounting at 51 allows the inner or active end portion 49 of pressure member 48 to swing horizontally toward and away from the corresponding end of the other pressure member 47, to thus vary the width of the restriction between these ends of the pressure members through which the bag neck is forced. A spring 53 (see Fig. 7) functions to yieldingly urge pressure member 48 toward member 47, to thus continuously resist relative separating movement of the pressure members.

As a bag neck is forced through the restriction offered by pressure members 47 and 48, two pressure sensitive tapes 12 are simultaneously advanced between the pressure members at opposite sides of the bag neck, with the adhesive bearing sides of the tapes in engagement ahead of and behind the bag neck, so that the pressure members 47 and 48 cause the pressure sensitive tapes to be tightly secured together and to the bag neck (see Fig. 8). The two tapes are fed from the previously mentioned supply rolls 17, which may be mounted at opposite ends of a frame carried stationary member 54 for rotation about spaced vertical axes. The two tapes extend horizontally inwardly from rolls 17 and through a pair of angularly converging passages or openings 55 formed in the pressure members between their end portions 49 and their main portions, so that the tapes may then pass along the inner sides of the pressure members at opposite sides of the bag neck. The end portions 49 of the pressure members may be attached to the main portions of the pressure members by suitable rigid connector strips 149, which are welded or otherwise attached to the top and bottom of the connected parts.

After a bag has advanced to the position of Fig. 8, and

tapes have been applied to it and sealed together at opposite sides of the bag neck, the tapes are then cut off from the supply tape by means of a cutter blade 56 which moves horizontally (to the right as seen in Fig. 8) across and in engagement with transverse end faces 57 of pressure members 47 and 48. This cutter blade 56 may taper to a point 58, adapted to initially pierce the two tapes during a cutting operation. After the tapes are cut, blade 56 returns to the left to its Fig. 8 position, so that the next successive bag neck can be advanced through the pressure members. As will be apparent, the formation of the end portions of the pressure members and cutter blade 56 is such that the cutters, upon each cutting operation, leave between the pressure members portions of the two tapes which are already sealed together and will serve as the leading portion of the seal for the next bag.

In order to mount cutter blade 56 for its desired lateral movement, this blade is rigidly attached to a shaft 59, which is pivotally journaled within a bearing 60 carried by an arm 61. This arm 61 is in turn pivotally attached at 62 to the underside of element 52 for swinging movement about a vertical axis, and is yieldingly urged by a spring 63 in a clockwise or cutter retracting direction as seen in Fig. 2. Arm 61 and the carried cutter 56 are intermittently swung in a counterclockwise direction about pivotal mounting connection 62 in timed relation to the advancement of chain 14, to cause the cutter to cut off the tapes 12 each time that a bag neck reaches the Fig. 8 position. Such counterclockwise actuation of arm 61 is effected by means of an elongated member 64 which is rigidly attached in fixed relation to and extends diametrically with respect to sprocket wheel 28, and which carries at its opposite ends a pair of rollers adapted to intermittently engage and deflect an elongated arm 66 which is rigidly attached to member 61 at 67. As will be obvious from Fig. 2, member 64 turns in a counterclockwise direction with sprocket wheel 28, so that rollers 65 intermittently engage the inclined or angular end surface 68 of member 66 to cam member 66 and the attached parts in a counterclockwise direction about mounting 62. Upon each such actuation of member 66, the cutter 56 is caused to perform a cutting operation, and is then released for retraction by spring 63 when roller 65 moves out of engagement with arm 66. For always maintaining cutter 56 directly against faces 57 of pressure members 47 and 48, a coil spring 69 is provided, which spring is connected at its opposite ends to member 66 and a pin 70 projecting from shaft 59, to urge shaft 59 and the cutter in a counterclockwise direction about the axis of bearing 60.

As the neck of one of the bags is advanced through the restriction formed by pressure members 47 and 48, the gripping unit 15 exerts advancing force against the neck beneath the pressure members, but of course cannot exert such a force above the pressure members. Consequently, unless other means were provided for assisting in advancing the neck through the pressure members, there might be a tendency for the upper portion of the bag neck to be deflected rearwardly, with the result that the neck might not be properly taped closed. For this purpose, we provide above the pressure members a neck advancing part 70, which is attached in fixed relation to and therefore rotates with sprocket wheel 28 and cutter actuating element 64. Part 70 extends essentially diametrically with respect to and above sprocket wheel 28, and has a pair of V-shaped notches 71 formed in the leading faces of its two opposite ends. This part 70 is so designed as to advance into engagement with the neck of each bag at a location above pressure members 47 and 48 as the neck approaches the location at which the tape is applied to the neck. Thus, part 70 and the gripping unit act to advance the bag neck through the restriction offered by pressure members 47 and 48 and by force exerted both above and beneath the pressure members

(parts 70 and 31 travelling at exactly the same speed during such advancement). The apex of the V-shaped notch 71 is so located as to be directly above the innermost end portion of each of the throats 33 during the tape applying operation, so that the bag neck is engaged within this apex portion of the notch 71. In order that part 70 may not unduly deflect forwardly the upper portion of the bag neck, there is provided at a location near or somewhat beyond the location of the cutter, and above the plane of part 70, a transverse rod-like element 72, which is attached by a member 73 to frame part 52, and which is engaged by the leading side of the bag neck as the neck and tape are being forced through the narrowest portion of the restriction offered by pressure members 47 and 48. After the taping and cutting operation has been completed, the top portion of the bag neck is capable of bending downwardly to an extent allowing it to pass under the stationary backing member 72, to advance the bag toward the discharging location.

The part 18 for actuating holding member 36 to release the bag into receptacle 19 is preferably a roller mounted to a stationary member 75 for rotation about a vertical axis. Member 75 is attached in any suitable way to the frame of the apparatus, as by attachment to the previously discussed sprocket mounting element 29. For engaging roller 18, arm 39 of member 36 has a semi-circular rounded portion 76, which is so positioned as to engage roller 18 when one of the gripping units 15 is moved past the location of roller 18 with part 36 and its arm 39 in the full line bag holding position of Fig. 5. As the portion 76 of one of the arms 39 thus engages roller 18, such engagement causes element 36 to swing about its axis 37 from the full line bag holding position of Fig. 5 to the broken line released position, so that the bag is released to fall from its position of retention within throat 33 and into receptacle 19. This, of course, readies the gripping unit 15 for reception of another bag as the gripping unit again moves along its endless path toward the fastening location.

To now describe a cycle of operation of the machine, assume first that the apparatus is in operation, with conveyor 14 being continuously driven by motor 21 and in a counterclockwise direction as seen in Figs. 1 and 2. Also, assume that all of the gripping units 15 have their various holding parts 36 actuated to the bag releasing position shown in broken lines in Fig. 5 and shown in Fig. 3. With the apparatus in this condition, an operator may stand at a location near sprocket wheel 25, and then manually attach the untaped bags to the gripping units as the units pass that location. As previously discussed in some detail, the neck of each bag is initially in a partially closed or gathered condition (see Fig. 3), and is inserted into the tapering throat 33 of one of the plates 31, to deflect arm 39 inwardly with respect to the throat, so that overcenter spring 43 passes its center position to cause arm 38 to rapidly and positively gather the bag neck and tightly confine it in the holding position of Fig. 5 within the inner portion of the throat. With the bag thus suspended, the continued endless advancing movement of the gripping unit and carried bag advances the bag neck between pressure members 47 and 48, the advancing action being aided by engagement of the neck at a location above the pressure members by part 70. As the bag neck is advanced between the pressure members, the moving neck engages and correspondingly advances the two tapes 12, so that the tapes act to enclose and tightly fasten the bag neck. As each neck reaches the location of Fig. 8, one of the rollers 65, which swings about the axis of sprocket 28 with the sprocket, engages cam surface 68 of member 66, to deflect member 66 away from the axis of the sprocket, and thus swing part 61 about the axis of its mounted pin 62, to cause cutter 56 to cut off the tapes. The taped bag is then further advanced by the gripping unit 15 until portion 76 of arm

33 engages roller 18 to release holding part 36 and allow the bag to fall into receptacle 19.

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 fastening means along said path operating to tape closed said neck portions held by said units, each of said units including a structure forming a throat of progressively decreasing width into which said neck portion of a bag is movable toward a reduced width inner end of the throat, each unit including an element adapted to extend across said throat and mounted for swinging movement relative to said throat from an outer retracted position to an inner holding position and toward said reduced width inner end of the throat in a direction to follow the neck into the throat and thereby gather and hold the neck within the inner end of the throat, said element being positioned to allow free withdrawal of the bag from said throat in said retracted position but to prevent such withdrawal in said holding position, each unit including a second element connected to said first element to swing therewith relative to the throat and adapted to be deflected inwardly by movement of a bag into the throat and by said deflection to swing said first element from said retracted position toward said holding position, and each unit including an overcenter spring operable to yieldingly hold said first element in retracted position and operable upon said inward deflection of said second element by a bag to move past a dead center position and then yieldingly urge said first element to said holding position to gather and retain the bag neck, said spring being closer to its dead center position when the first element is in said retracted position than when the first element is in said holding position, so that the elements can be deflected inwardly past dead center and toward holding position by a relatively light force exerted by an inmoving bag neck, and the elements can then move inwardly far enough beyond dead center to exert a relatively greater force on the bag neck to hold it in the throat, said fastening means including means feeding pressure sensitive tape to a bag neck as it is advanced by one of said units along said endless path, and a pair of relatively deflectible pressure members forming a yielding restriction through which the neck and tape are forced by the movement of said units, to thereby tape the neck closed.

2. Apparatus as recited in claim 1, in which said two elements comprise two swinging arms rigidly connected together and mounted to said throat structure for swinging movement relative thereto, said spring having two ends exerting yielding force against said throat structure and said second element respectively.

3. Apparatus as recited in claim 1, including means along said endless path beyond said fastening means for deflecting said swinging elements outwardly with respect to the throat to release the bag neck after fastening of the neck.

4. Apparatus as recited in claim 1, including cam means positioned along said endless path beyond said fastening means at a location to engage said second element and deflect it and the first element in a direction to release the taped bag from the throat.

5. Apparatus as recited in claim 1, including a movable auxiliary bag advancing part moving in timed relation with said conveyor and in a relation to swing into engagement with different bags held by said units as they near said pressure members and to engage each bag neck at a location spaced from its point of engagement with said throat forming structure and assist in displacing the neck through said restriction formed by the pressure members, said pressure members being positioned to act against the neck between said throat forming structure and said auxiliary bag advancing part.

6. Apparatus as recited in claim 1, in which said fastening means include means operating in timed relation with said conveyor for cutting off the tape after passage through said restriction.

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 fastening means along said path operating to tape closed said neck portions held by said units, each of said units including a structure forming a throat of progressively decreasing width into which said neck portion of a bag is movable toward a reduced width inner end of the throat, each unit including an element adapted to extend across said throat and mounted for swinging movement relative to said throat from an outer retracted position to an inner holding position and toward said reduced width inner end of the throat in a direction to follow the neck into the throat and thereby gather and hold the neck within the inner end of the throat, said element being positioned to allow free withdrawal of the bag from said throat in said retracted position but to prevent such withdrawal in said holding position, each unit including a second element connected to said first element to swing therewith relative to the throat and adapted to be deflected inwardly by movement of a bag into the throat and by said deflection to swing said first element from said retracted position toward said holding position, and each unit including an overcenter spring operable to yieldingly hold said first element in retracted position and operable upon said inward deflection of said second element by a bag to move past a dead center position and then yieldingly urge said first element to said holding position to gather and retain the bag neck, said fastening means including means feeding pressure sensitive tape to a bag neck as it is advanced by one of said units along said endless path, and a pair of relatively deflectible pressure members forming a yielding restriction through which the neck and tape are forced by the movement of said units, to thereby tape the neck closed.

8. 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 fastening means along said path operating to tape closed said neck portions held by said units, each of said units including a structure forming a throat of progressively decreasing width into which said neck portion of a bag is movable toward a reduced width inner end of the throat and including an element movable relative to said throat between an active position for holding a bag neck in the throat and a released position in which a neck may move into and out of the throat, said fastening means comprising means for feeding pressure sensitive tape to a bag neck as it is advanced by one of said units along said endless path, a pair of relatively deflectible pressure members forming a yielding restriction through which the neck and tape are forced to tape the neck closed, and a movable auxiliary bag advancing part moving in timed relation with said conveyor and in a relation to swing into engagement with different bags held by said units when they are near the pressure members and to engage each bag neck at a location spaced from its point of engagement with said throat forming structure and assist in displacing the neck through said restriction formed by the pressure members, said pressure members being positioned to act against the neck between said throat forming structure and said auxiliary bag advancing part.

9. Apparatus as recited in claim 8, in which said conveyor is an endless flexible conveyor, there being two wheel structures about which opposite end portions of said flexible conveyor extend and by which the conveyor

is mounted for endless movement, and said auxiliary bag advancing part including an arm mounted for rotation with one of said wheel structures to swing into engagement with the bag necks at the location of said one wheel structure.

10. Apparatus as recited in claim 9, in which said arm of the bag advancing part contains a recess of progressively decreasing width facing forwardly in the direction

of arm movement and adapted to receive the bag neck as it is advanced by said arm.

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