Feb. 27, 1968 A. D. PAXTON ETAL 3,370,396

BAG CLOSING MACHINE

Filed April 20, 1965 4 Sheets-Sheet 1

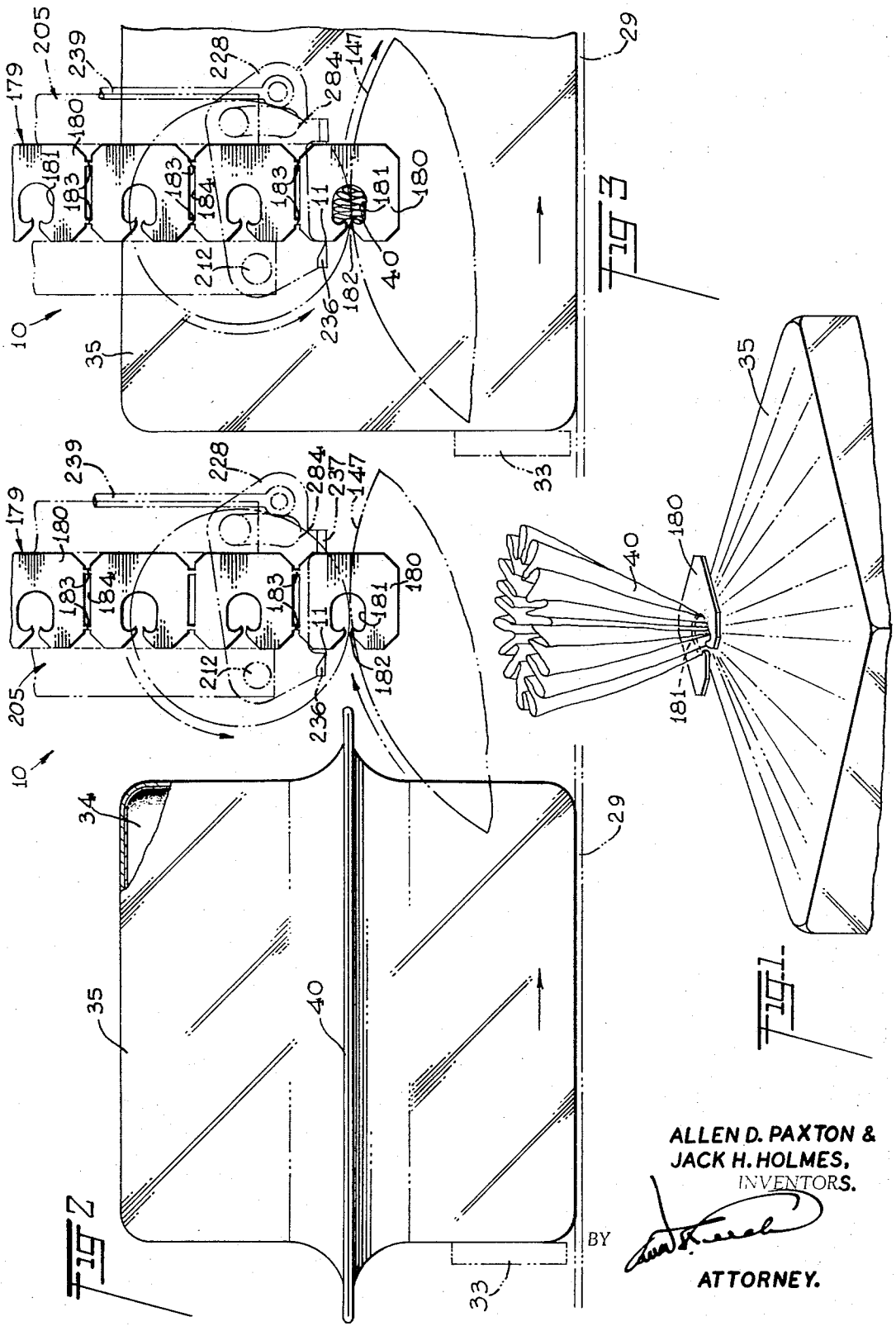


FIG. 3

FIG. 1

FIG. 2

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BAG CLOSING MACHINE

Filed April 20, 1965 4 Sheets-Sheet 2

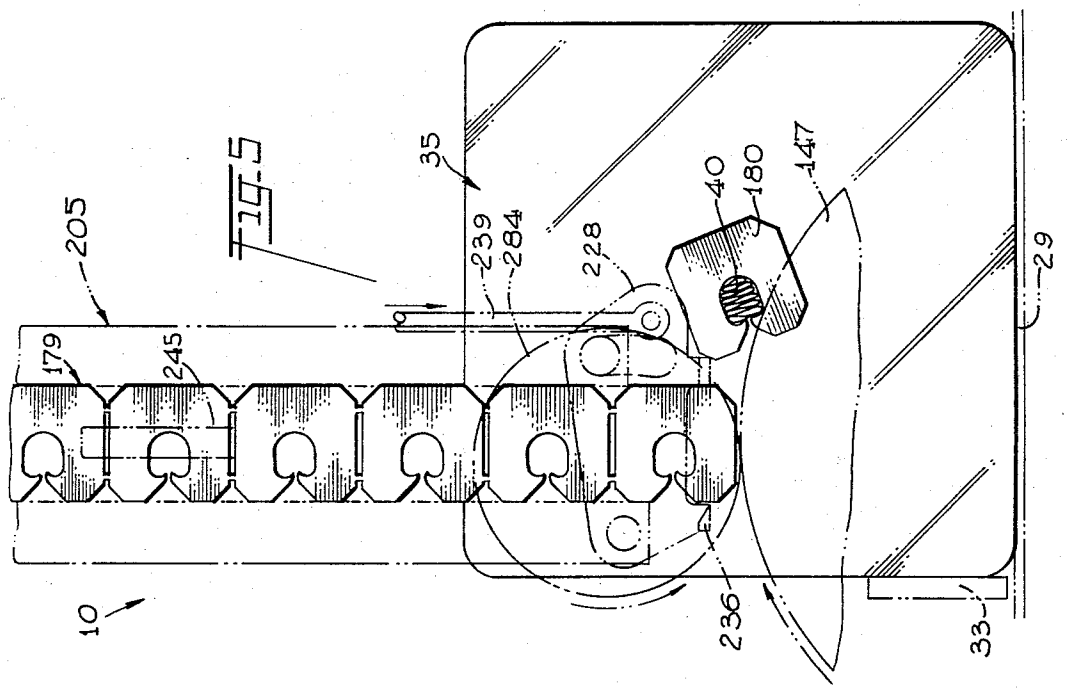


FIG-5

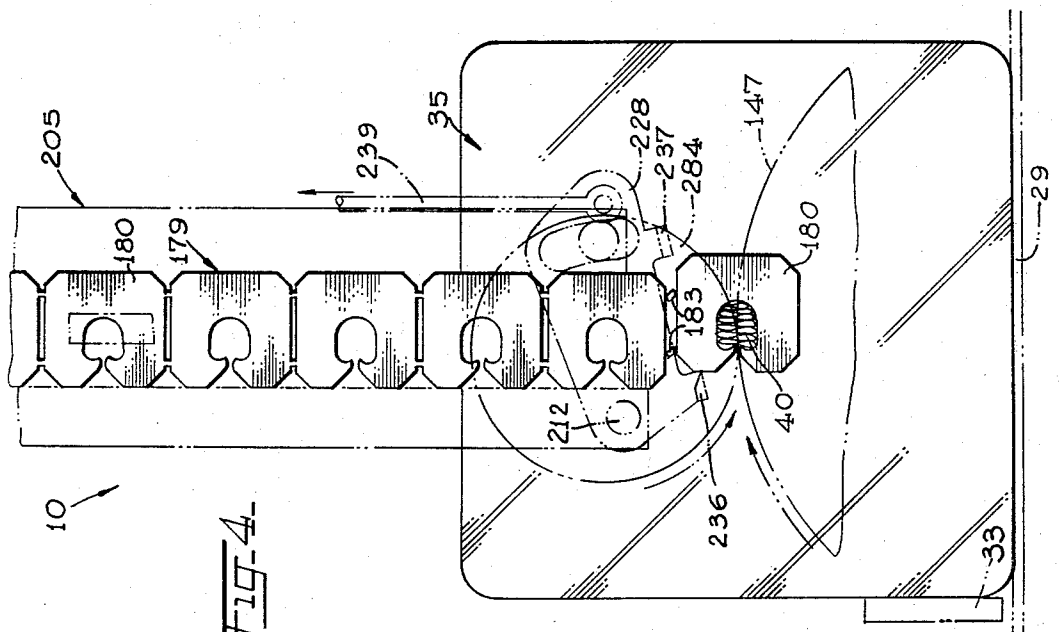


FIG-4

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Filed April 20, 1965 4 Sheets-Sheet 3

Fig. 6.

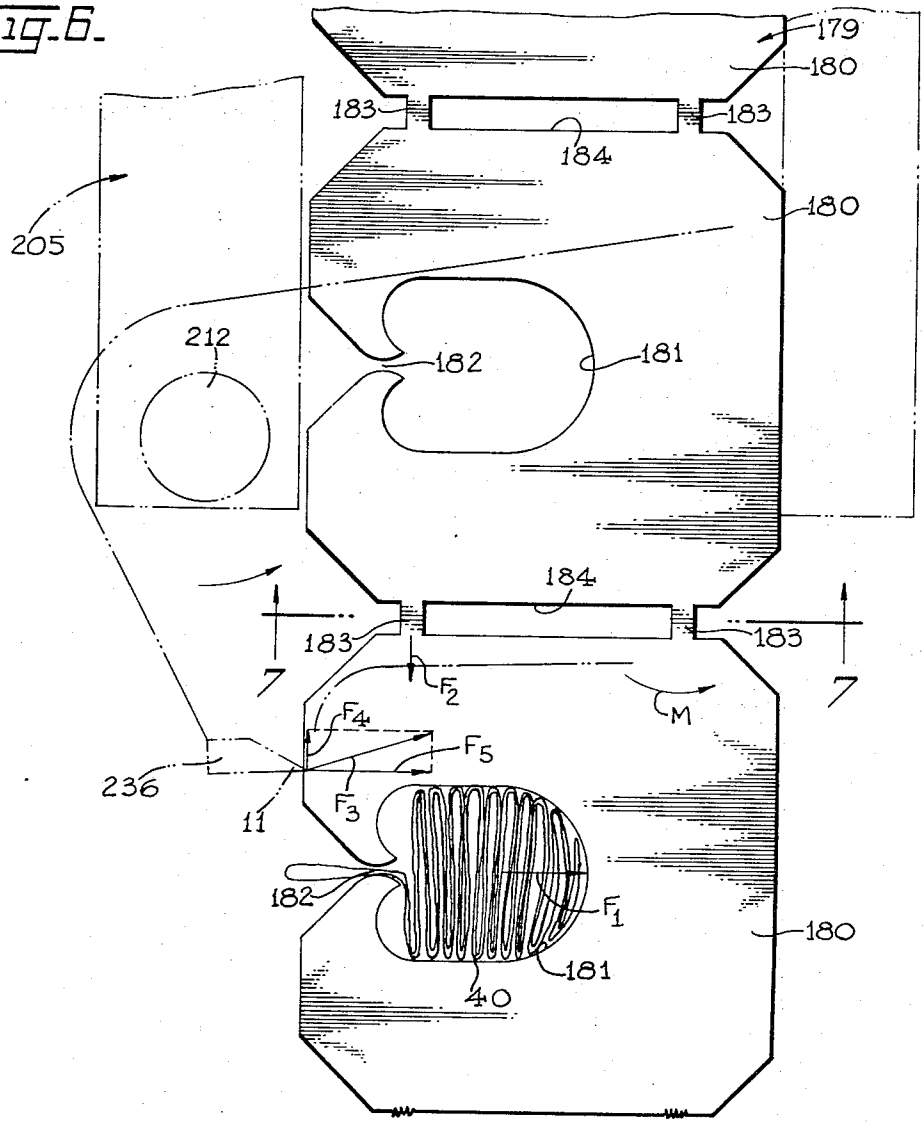
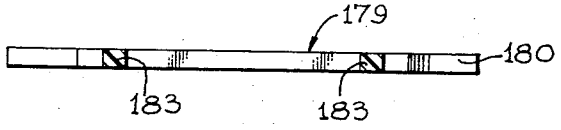


Fig. 7.



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Feb. 27, 1968 A. D. PAXTON ETAL 3,370,396

BAG CLOSING MACHINE

Filed April 20, 1965 4 Sheets-Sheet 4

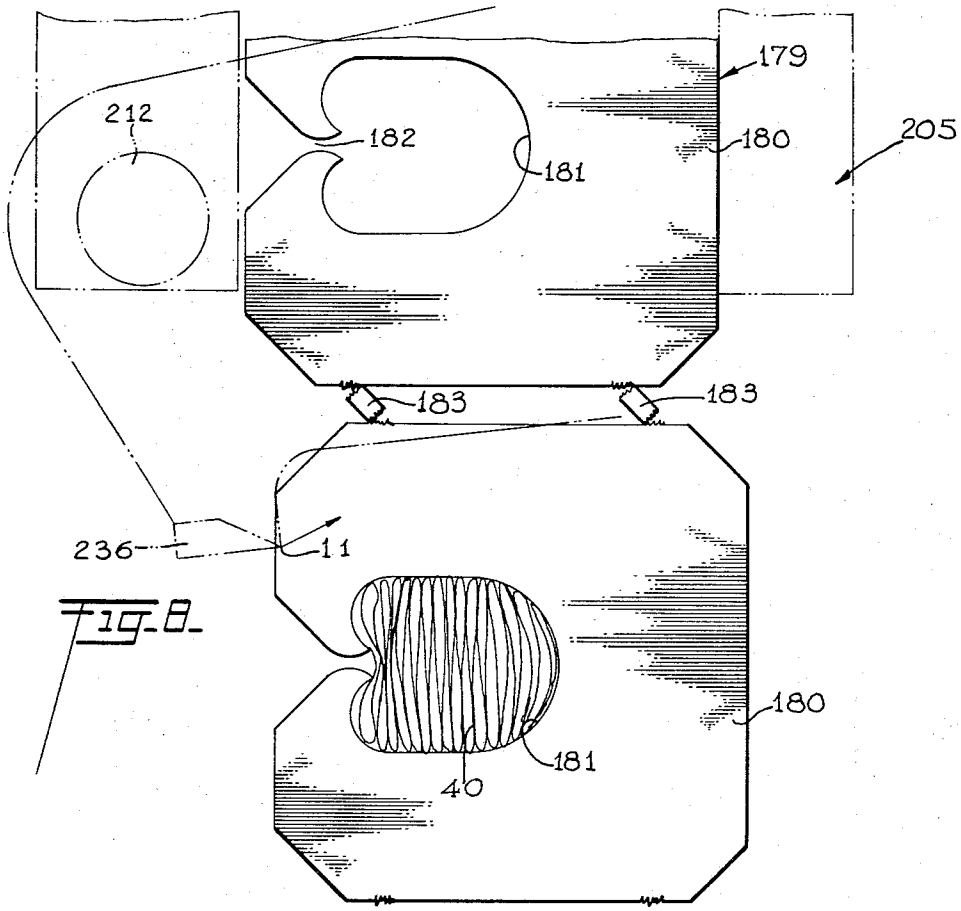


Fig. 8

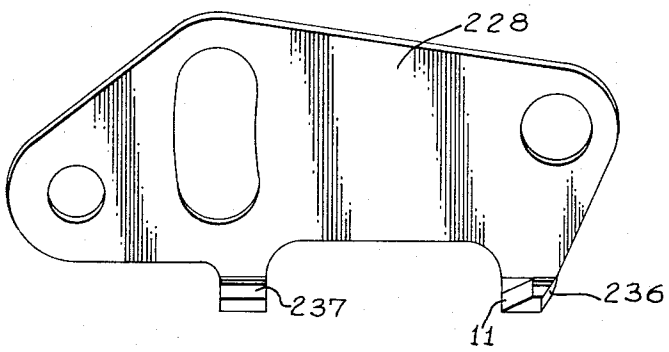


Fig. 9

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United States Patent Office 3,370,396
Patented Feb. 27, 1968

3,370,396

BAG CLOSING MACHINE

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Filed Apr. 20, 1965, Ser. No. 449,532
3 Claims. (Cl. 53—138)

ABSTRACT OF THE DISCLOSURE

A non-skid device for engaging a side edge of a flat plastic strip embodying a series of integrally united but separable bag closures to separate the lowermost closure from the strip following the application of said closure to the neck of the bag to close the latter.

This invention relates to apparatus for closing polyethylene bags and is an improvement on the apparatus disclosed in U.S. Patent No. 3,163,972 for applying the polystyrene multi-closure strip disclosed in U.S. Patent No. 3,164,250, in closing such bags.

The unique character of said polystyrene multi-closure strip lies in its comprising a consecutive series of individual flat sheet polystyrene closures, each consecutive pair of which is integrally connected by a laterally spaced pair of webs which are so dimensioned that the endmost closure of the strip and the next closure thereto may be readily separated from the webs connecting them together by a lateral shifting of one of said closures relative to the other. The separation normally results from a simultaneous cracking of the material of said strip in the transverse areas of union between opposite ends of said webs and the parallel transverse edges of the closures united thereby, thus completely separating said webs from said closures.

In the aforesaid patented bag closing machine provided for applying the individual closures of said multi-closure strip to plastic bags, the separation of each endmost closure from a strip is effected by a finger provided eccentrically on a rocker and extending axially therefrom so as to engage a side edge of said closure to shift said closure in the plane of said strip and parallel with the next adjacent closure, just after an open neck portion of a plastic bag has been fed through a narrow opening in that same edge of said closure into an inner enlargement of said opening forming a bag neck conforming mouth. These bags, each containing a product to be packaged therein, such, for instance as a loaf of bread, are advanced by a continuously travelling power conveyor over a path extending alongside the bag closing machine. The feeding of the neck of each bag into the mouth of a closure and the separation of the latter from the strip is accomplished automatically by the machine as the bag travels past the machine and without interrupting such travel.

Summary of the invention

In most instances in the commercial use of the aforesaid machine, the complete separation of the connecting webs from the endmost and next adjacent closures occurs incidental to the application of the endmost closure to a bag. In some instances however one or more webs are left united with a closure after this has been separated from the strip. Although numerous theories were advanced to explained this defect in the operation of said machine, the cause remained obscure until an intensive study was made of this problem which resulted in the present invention.

In this study, made by applicants, it was discovered that the defect of operation above noted is caused by a

tension stress induced in the rear web of the pair in question by the tugging of the bag neck horizontally on the endmost closure. This stress is great enough to rock the closure about the forward web, thus pulling the rear web downwardly with sufficient force to pull apart its connection with one or the other of the closures connected thereby so that it remains integrally united with the other of said two closures.

It will be recognized that, because this machine closes bags consecutively presented thereto, while in continuous movement at a rate of up to 150 per minute, a very close timing had to take place between the feeding of a bag neck into the endmost closure and the separation of that closure from the strip by the normal method above described, to prevent the latter malfunctioning as pointed out.

It is an object of the present invention to provide an improvement in the aforesaid patented machine which will minimize said malfunctioning and thus remove the necessity for paying such strict attention to timing the bag neck feeding and closure separation mechanisms of said machine.

Another object of the invention is to accomplish the foregoing object with a minimum amount of reconstruction of said machine.

Brief description of the drawings

FIG. 1 is a perspective view of an end portion of a polyethylene bag containing a product such as a loaf of bread, after having the open neck of the bag closed by a closure of the type to which this invention relates.

FIG. 2 is a diagrammatic operation view of the machine of the invention and illustrates the feeding of a bag neck towards the endmost closure of the strip in the machine with said bag neck aligned with the opening provided in the closure to receive the same.

FIG. 3 is a view similar to FIG. 2 illustrating the bag closing operation at the point where the neck has just been completely delivered into the internal enlargement of said opening which forms the bag neck closing mouth of the closure and shows the closure separating rocker of the machine rotated to cause the knife edge of the closure engaging element of said rocker to bite into an end edge of said closure just above said opening.

FIG. 4 is a view similar to FIG. 3 and illustrates a further point in the operation of said machine at which said rocker has rotated sufficiently to shift the endmost closure laterally relative to the closure next thereto, causing the material of the strip to crack in the areas of union between said closures and the two connecting webs so as to separate said closures simultaneously from said webs and said closures from each other.

FIG. 5 is a view similar to FIG. 4 illustrating the operation of said machine at a point in advance of that shown in FIG. 4 in which said rocker has been reversely rocked to its starting position and the strip feeding mechanism of the machine is operating to advance the strip to locate the next endmost closure thereof in the position vacated by the closure just applied to a bag.

FIG. 6 is an enlarged diagrammatic view showing a diagram of the forces produced in the endmost closure of the strip at the instant the sharpened edge of the rocker engages said closure at the stage in a closure application and separation cycle illustrated in FIG. 3.

FIG. 7 is a cross-sectional view taken on the line 7—7 of FIG. 6 and looking upwardly.

FIG. 8 is an enlarged view similar to FIG. 6 and illustrates the result the rectangle of forces shown in FIG. 6 has in assuring the normal fracturing of the material of the strip simultaneously in the areas of union between

the webs and the two lowermost closures connected thereby.

FIG. 9 is an enlarged perspective view of said rocker with the same reversed end-to-end from the position in which this is shown in FIGS. 2, 3, 4 and 5 so as to clearly show the structure of the lug of the rocker having the knife edge and the protecting lug on said rocker which is opposed thereto and is positioned beyond the endmost closure during the feeding of a bag neck into said closure so as to support said closure against being torn loose from said strip by the force of delivery of said bag neck thereto.

Description of the preferred embodiment

The improvement comprising the present invention is found in a single structural change in the rocker **228** of the automatic closure applying machine **28** disclosed in U.S. Patent No. 3,163,972 which issued Jan. 5, 1965, to Jere F. Irwin on a Bag Closing Apparatus. Excepting for the details of this modification in rocker **228**, reference is made to said patent for a disclosure of all the other details of the bag closing machine **10** of the present invention. The same reference numerals used in said patent in describing the closure applying machine **28** will be used wherever these are applicable in the disclosure herein of the bag closing machine **10**.

The closure applying machine **28** is also referred to in said patent as a "bag closing head **28**" which includes a spool shaped bag neck feeding rotor **145** embodying a pair of bag neck feeding wheels **147** and **148** which are coaxial and approximately equal in peripheral diameter and which is constantly rotated on a horizontal axis. Two rubber tired small-diameter wheels **283** and **284** are pivotally mounted in slightly staggered relation above and in tangential rolling relation with wheels **147** and **148** as shown in FIGS. 11, 12, 13 and 14 of the patent. The upper wheels are frictionally rotated by the lower wheels and the two pairs of wheels are employed for feeding the loose flattened neck **40** of a polyethylene plastic bag **35** into the closure mouth **181** of the endmost closure **180** of a closure strip **179** in which a consecutive series of said closures are united in closely juxtaposed relation by webs **183** formed integral with said closures.

The bag closing head **28** also includes a closure strip guide **205** which is positioned vertically so as to terminate at its lower end between the upper pair of wheels **283–284** as shown in FIGS. 11, 12, 13 and 14 of the patent.

A closure strip feed finger **245**, wtih suitable operating mechanism, is provided in said bag closing head **28** for intermittently feeding the closure strip **179** downwardly in guide **205** (see patent FIGS. 9 and 10) so as to position the lowermost closure **180** as shown in patent FIG. 11 with a narrow edge opening **182** and bag neck closing mouth **181** located in the plane of tangency between the lower and upper pairs of bag neck feeding wheels aforesaid.

A detent arm **225** is mounted on said strip guide and is spring biased to cause the lower pointed end of said detent arm to rest against the face of the closure strip **179** and drop into each of the transverse slots **184** formed in said strip between consecutive closures as this slot passes by said detent during a downward feeding of the strip. Said detent is so located on the strip guide **205** that one of said slots comes opposite said detent and receives the same at the conclusion of each downward feeding of the strip by the feed finger **245**. Thus the detent **225** acts to lock the strip against a reverse or upward movement following each downward feeding of said strip.

While thus being fed downwardly, the closure strip **179** is closely confined by the strip guide **205**, but the endmost closure **180** of the strip **179** is extended by each of the aforesaid feeding movements of the strip into an exposed position in which it is free to be shifted laterally relative to the next closure thereabove for separating the endmost closure from said strip immediately following the feeding of a bag neck into the neck confining mouth **181** of the endmost closure.

This separation is effected in the patented bag closing head **28** by the pivotal mounting of rocker **228** on the lowermost of a group of bolts **212** used in assembling closure strip guide **205**, and rocking said rocker upwardly about said bolt so as to shift a web breaking lug **236** which is bent forwardly from the lower edge of a near portion of said rocker, to bring this lug into engagement with an end edge of said endmost closure, just above the bag neck receiving opening of the latter, so as to shift the endmost closure laterally in the plane of said strip and thus cause the separation of the webs from the endmost closure and the closure next thereabove, in the manner already described. This rocking of rocker **228** is accomplished by an actuating link **239** and takes place in carefully timed relation with the delivery of the bag neck by the two pairs of wheels aforesaid into the neck receiving mouth of the endmost closure so that the separation of the latter from said strip immediately follows the delivery of the bag neck into that closure. The separation of the endmost closure from the balance of the strip **179** frees said closure to be carried away by the continuously moving bag on which it has just been applied.

The rocker **228** also has a web protecting lug **237** which normally is disposed in close relation with the far edge of closure strip **179** and in particular with the endmost closure **180** thereof, so as to hold the latter closure in vertical alignment with the balance of said strip until the moment when it is desired to separate the same therefrom.

The coordinated operation of the above mentioned elements, as described, and as more fully disclosed in said Patent No. 3,163,972, is effected by an independent cyclic drive, each cycle of which is triggered by contact of a bag neck **40**, as it is caught between the tangent pairs of drive wheels, with a clutch trigger **299**. There is thus a very closely timed relation between the delivery of the bag neck **40** into the mouth of the endmost closure **180** and the separation of the latter from the closure strip **179**.

As already stated, however, a tendency has been noted for the near web **183** to be pulled from its connection, either with the endmost closure or with the closure next thereabove, so that this web remains integrally connected with one or the other of these closures after the endmost closure has been separated from the strip. The remedy for this defect provided by the present invention, and which has proved very effective in overcoming the same, has been to grind a sharpened edge **11** on the lug **236** of the rocker **228** so that this edge will bite into the edge of the endmost closure **180** when it first engages the same so as to exert a lifting force on this portion of said closure which overcomes any downward stress to which this closure is being subjected by the bag neck confined in mouth **181** thereof. The biting of knife edge **11** of the lug **236** into the material of the endmost closure **180** compels that corner of that closure to travel with said knife edge along the arc it inscribes about the bolt **212** on which the rocker **228** is pivoted. The path of this arc is such as to replace the downward stress, heretofore placed on the forward web **183**, with an upward compressive stress which assures the normal operation of the rocker **228** in causing the cracking of the material of the strip simultaneously in the areas of union between opposite ends of the webs **183** and the two consecutive closures connected thereby. The application by the knife edge **11** of such an upward compressive stress to the endmost closure **180** is made possible by the action of detent **225** in dropping into a slot **184** between adjacent closures in the strip **179** at the end of each downward feeding movement of the strip. The detent **225** thus prevents an upward reverse movement of the strip in response to the upward pressure put on the endmost closure **180** by the knife edge **11**.

For an illustration of the theory on which this invention is based, reference is now made to FIG. 6. In this view, the arrow F1 represents a force applied in the direction of said arrow against endmost closure **180** by a bag neck **40** confined within mouth **181** of said closure, due to the product **34** confined in the bag **35** being in continuous motion on conveyor **26** which is travelling in the direction of arrow F1.

Force F1 naturally tends to carry endmost closure **180** with it and induces a downward tensile stress indicated by arrow F2 in the area of the left or forward web **183** of a pair of these webs connecting the endmost closure to the next closure thereto. Concurrently with the setting up of tensile stress F2, the force F1 tends to rotate the entire endmost closure **180** about the right hand or rear web **183** in a path indicated by the arc-arrow M.

In the present invention, the rocking of rocker **228** is timed to start before an opportunity is given for the force F2 developing to a point where it will pull apart the area of union connecting one end or the other of the forward web **183** from the two closures joined thereby. The initial contact of the knife edge **11**, provided by this invention on closure breaking lug **236**, with the left or front edge of the endmost closure **180** causes this edge to bite into the closure to foreclose the possibility of the improper separation of either of the webs **183** from the closures joined thereby and assures this separation taking place in the normal manner in which the webs are completely separated from said closures in the areas in which said webs are united therewith.

In FIG. 6, vector F3 represents the direction and size of the force applied to the forward upper corner of endmost closure **180** by the application of knife edge **11** thereto. Resolving this into a rectangle of forces, arrow F4 indicates an upward component force delivered in the direction of said arrow to said closure, and arrow F5 represents a horizontal component force applied by said knife edge to said closure. Force F4 is seen to be in opposition to vertical downward stress F2 and cancels this out while force F5 operates to shift the endmost closure of **180** horizontally relative to the next closure **180** of strip **179** as illustrated in FIG. 8 so as to crack the material of the strip in the areas of union between opposite ends of the webs **183** and the consecutive closures connected thereby so as to completely separate these webs from said closures as shown in this view.

The claims are:

1. In a machine for (a) receiving a strip of stiff sheet plastic material incorporating a series of bag closures united end-to-end by narrow frangible webs formed integrally at their opposite ends with adjacent closures in said series, each closure having in an edge thereof formed by a side edge of said strip, a narrow opening enlarged inwardly to form a bag-neck confining mouth, and (b) applying said closures to neck portions of flexible bags, with each bag containing a product, so as to close said bags and package said products, the combination of: guide means for receiving said closure strip; means feeding said closure strip lengthwise along said guide means to position the endmost closure with its side edge opening at a given position and facing in a given direction; means for feeding a flattened neck of a bag towards and through said edge opening to deliver an entire transverse section of said bag neck into the bag neck confiing mouth of said endmost closure; and means responsive to the feeding of said bag neck into said closure mouth to shift said closure laterally relative to the balance of said strip, thereby simultaneously fracturing the webs between said endmost closure and the closure next thereto at the points of connection between said closures and said webs, said means including: a rocker element disposed parallel with and close to said strip, said element being pivoted on an axis normal to the plane of said strip and located a substantial distance above the plane of said opening of the endmost closure and spaced slightly outwardly from said side edge of said strip; a lug provided on said element and extending at a right angle therefrom through the plane of said strip adjacent said side edge of said strip, said lug having a sharpened knife edge facing said endmost closure above said edge opening therein; and means for rocking said rocker element about said axis to swing said knife edge lug against said endmost closure so that it bites into said closure and lifts upon this, further swinging of said element shifting said endmost closure laterally relative to the closure next thereabove to accomplish the fracturing of said webs at the points of their connection with said closures, said upward lifting on said endmost closure by said knife edge substantially preventing interference with said fracturing of said webs by said bag neck pulling on said endmost closure.

2. In a machine for (a) receiving a strip of stiff sheet plastic material incorporating a series of bag closures united end-to-end by narrow frangible webs formed integrally at their opposite ends with adjacent closures in said series, each closure having in an edge thereof formed by a side edge of said strip, a narrow opening enlarged inwardly to form a bag neck confiing mouth, and (b) applying said closures to neck portions of flexible bags, with each bag containing a product, so as to close said bags and package said products, the combination of: guide means for guiding said closure strip along a given path; means to feed said strip intermittently through said guide means by successive movements each equal in length to the length of the endmost of said closures plus the length of the webs connecting said closure to the next closure in said strip, each such feeding movement concluding with said endmost closure located at a station in which said endmost closure extends from confinement by said guide means, for applying said closure to the neck of a flexible plastic bag; detent means preventing a reverse movement of said strip following the completion of each of said feed movements; and means for shifting said endmost closure laterally in the plane of said strip, relative to the next closure of said strip to cause the material of said strip to crack in the areas of union between said closures and the webs connecting the same to separate said webs from said closures and said closures from each other, said means including an element having a sharp knife edge, and means for shifting said element to engage said sharp knife edge with that portion of said side edge of said strip comprising an upper portion of said endmost closure so as to bit into said closure to prevent slippage between said element and said closure, thereby assuring that the path in which said element is thus shifted produces a lateral shifting in said path of said endmost closure, effecting its consequent separation from said strip.

3. A machine as recited in claim **2** wherein the path along which said element with a sharp knife edge is shifted to engage said edge of said endmost closure and then shift said closure laterally, is the arc of a radius the axis of which lies alongside said strip edge and normal to the plane of said strip above the upper end of said endmost closure.

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