

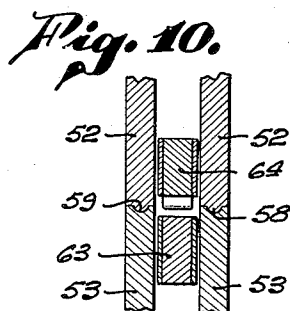
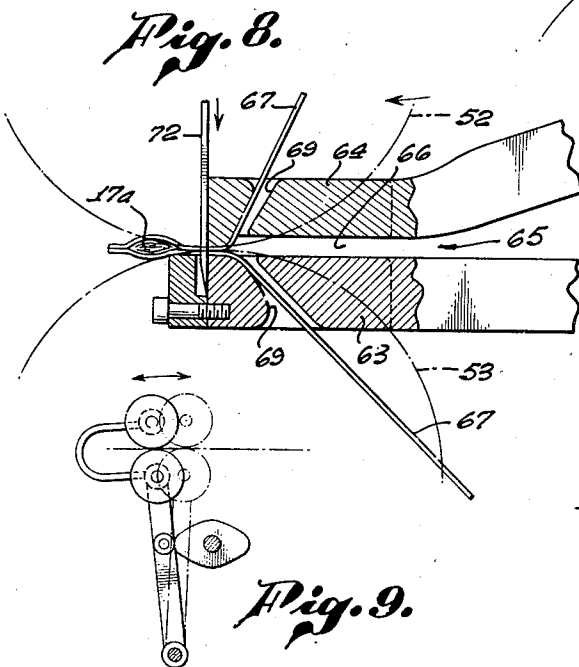
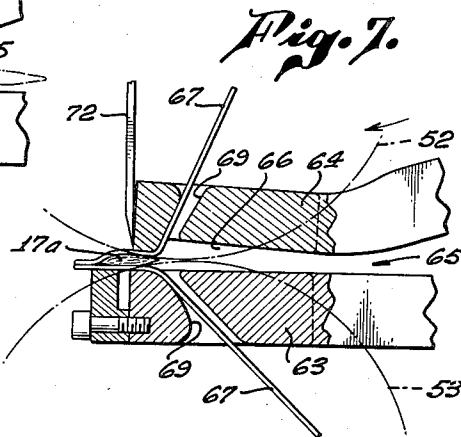
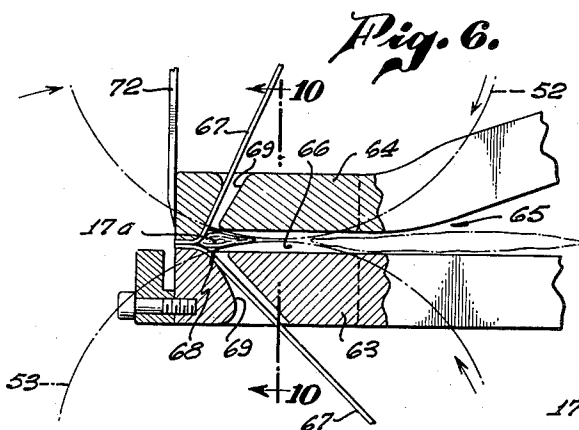
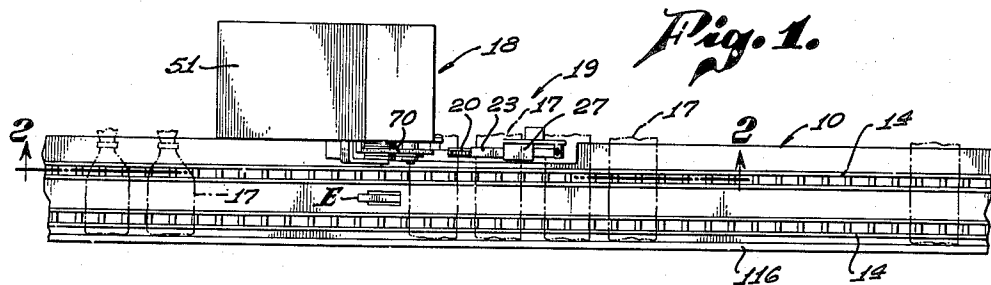
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L. H. PLATT ET AL
BAG CLOSING MACHINE

2,840,967

Filed March 19, 1954

3 Sheets-Sheet 1



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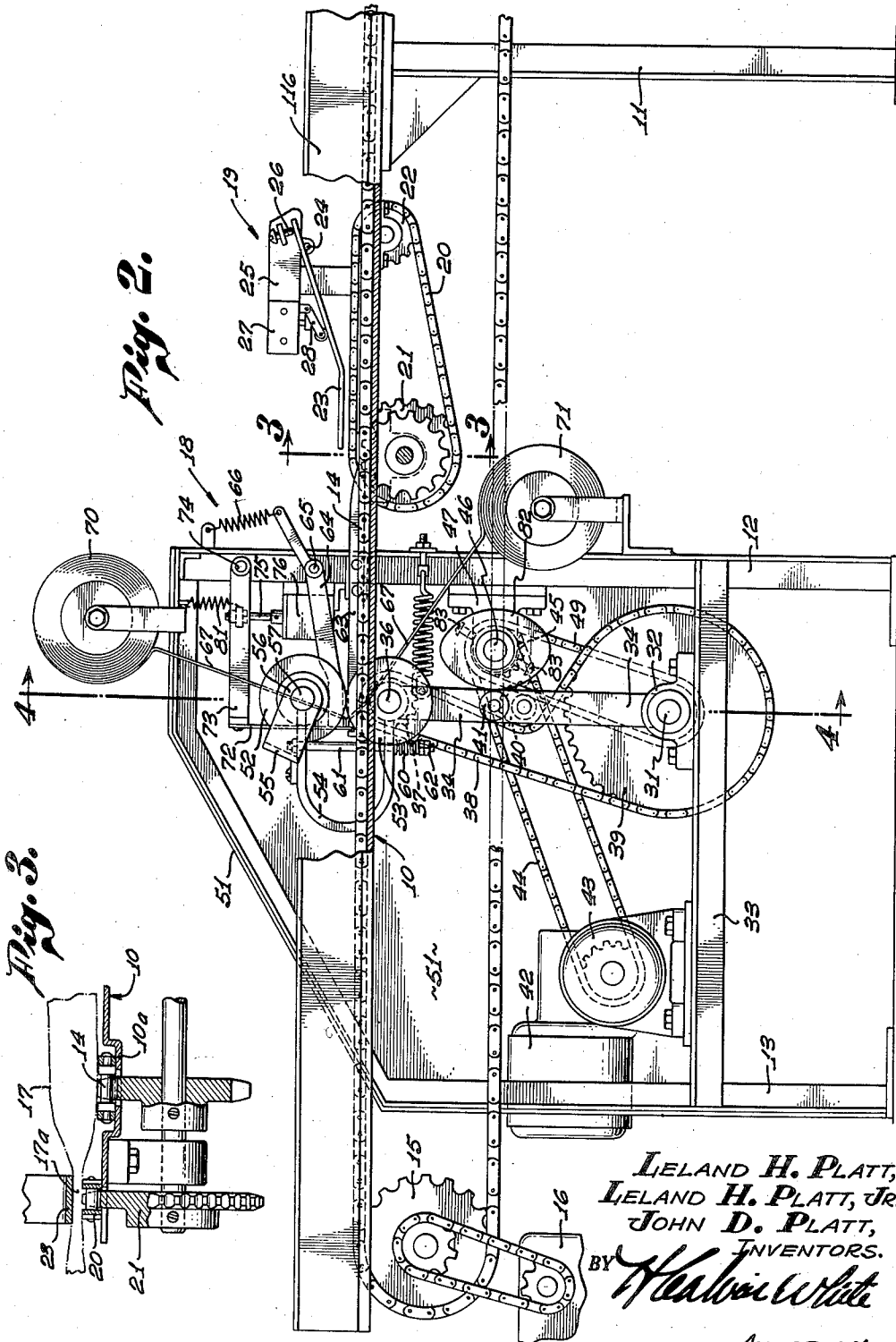
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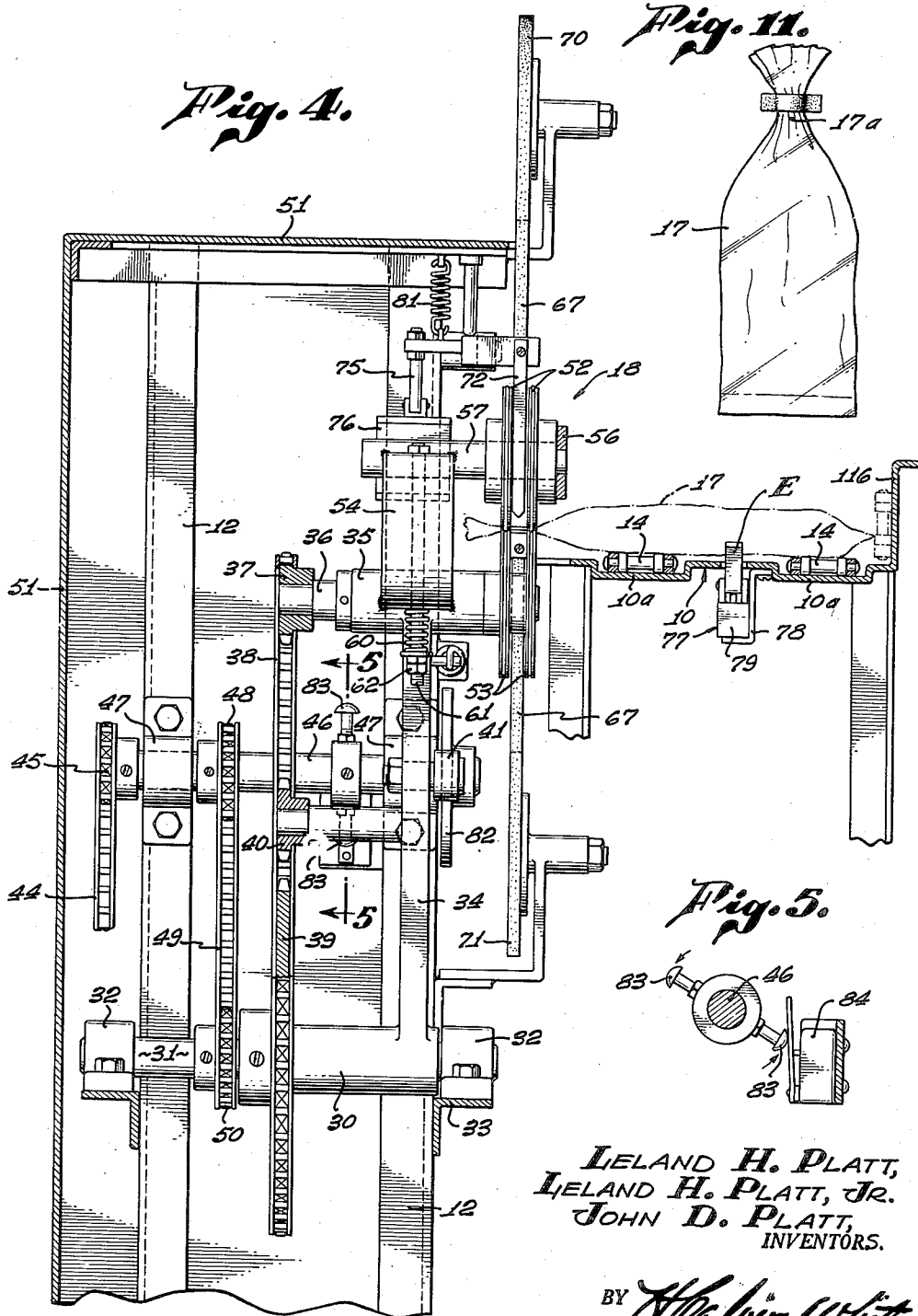
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2,840,967

BAG CLOSING MACHINE

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Application March 19, 1954, Serial No. 417,382

23 Claims. (Cl. 53—198)

This invention has to do with improvements in apparatus for gathering and closing the neck portions of flexible bags, particularly those made of thin transparent resinous or other plastic materials which have come into increasing popularity for the packaging of many commodities. While applicable to the closing of bags having various sizes, shapes and uses, the invention has developed as a solution to the problem of machine closing at high speeds these transparent plastic bags containing foodstuffs such as washed and topped carrots, and accordingly the invention will be described with reference to that typical adaptation.

In the course of their preparation for the market, the carrots are washed, topped and placed in initially flat plastic bags, the permeability and other characteristics of which tend toward extended keeping of the carrots in good condition. The bags ordinarily are hand filled to a depth (variable in accordance with the lengths of the carrots) spaced some distance from the open mouths of the bags. Heretofore the practice has been to close the bags by such expedients as heat sealing and hand gathering and tying or taping. Being essentially hand operations, their accomplishment has been relatively slow and has required a considerable number of workers confined to this particular job in packing houses having any sizeable output.

Our broad objective is to provide for machine closing of the bags by the use of essentially simple and low cost equipment having the capacity at high speed to gather together the initially distended (open) neck portions of the bags, and to then secure the necks in closed condition. This we have achieved in the hereinafter described machine which, by way of comparison, may have a capacity for closing around one hundred twenty-five bags per minute, as compared with a rate of about fifteen per minute per worker using essentially hand closing methods.

The invention is predicated upon the general concepts of providing (1) a pair of surfaces positioned to receive between them the forward side edges of an advancing succession of the filled bags, (2) moving these surfaces, as by wringer roll action, so that they tend to advance the bag material positively and at high speed, (3) temporarily blocking the material being advanced and thereby causing it to become gathered, (4) effecting a retained closed condition of the gathered bag neck, and (5) bodily displacing the gathering surfaces so as to free the closed bag. While the particularities of the mechanisms so operating to close the bags may vary or be made to vary in accordance with the skills of the art, we have devised a form and combination which performs effectively and may be used for purposes of describing the invention, as an illustration and typical embodiment.

Generally considered, the principal components of the combination comprise a pair of opposed and engaging surface gathering wheels which receive between them the forward side edges of the advancing bags, the wheels rotating in opposite directions and at least one of the wheels being driven so that they tend to rotate in opposite directions and thus positively feed and advance the bag ma-

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terial to the gathering location. The bag material is prevented temporarily from passing free beyond the wheels by what may be termed a blocking means, the principal purposes of which are to arrest advancement of the bag material until its neck portion is completely gathered by the material being crowded against the blocking means and to retain the gathered form of the material while it is being acted on by a retaining means, preferably, though typically, a device for placing and securing pressure sensitive tape about the bag neck. Freeing of the closed bag is accomplished by bodily displacement, and specifically oscillation, of the gathering wheels in the general direction of the bag advancement.

In the interests of confining this combination of components to a compact arrangement, and one which because of its compactness permits of the high speeds achieved, the gathering wheels are arranged in opposed pairs with the wheels in each pair spaced apart. Using this arrangement of the wheels, the blocking means actuated or controlled extraneously, may be located between the pairs in direct proximity to the discharge sides of the wheels, and individual tapes may be fed convergently to a location in direct proximity to the gathering means, so that at one station, the bag neck may be brought very rapidly into gathered condition and then closed by the tapes being brought together about the neck. And this same arrangement conveniently accommodates an intermittently operated knife which severs the tapes instantly upon their application to the bag.

The invention further contemplates the provision of safety means for preventing fouling of the closing assembly in instances where a bag is overfilled, e. g. contains one or more unusually long carrots, to an extent that the bag contents would enter between the gathering surfaces or wheels. As will appear, this object may be accomplished by providing in the path of the bags approaching the gathering surfaces, a device which is responsive to an overfilled condition of the bag, to stop the gathering wheels until the offending bag is removed.

While additional features and particular objects might be recited at length, the invention will now be understood to best advantage by proceeding with a detailed description of the typical embodiment illustrated by the accompanying drawings, in which:

Fig. 1 is a general plan view of the machine;

Fig. 2 is a vertical sectional view of the bag feeding and closing mechanism taken in the plane of line 2—2 of Fig. 1;

Fig. 3 is a cross-section on line 3—3 of Fig. 2;

Fig. 4 is an enlarged vertical section on line 4—4 of Fig. 2;

Fig. 5 is a section taken on line 5—5 of Fig. 4;

Figs. 6, 7, and 8 are fragmentary enlarged sections illustrative of the bag gathering, tape applying and cut-off functions of the machine;

Fig. 9 is a view illustrating diagrammatically the oscillating travel of the gathering wheel, tape applying and cut-off mechanisms;

Fig. 10 is a section taken on line 10—10 of Fig. 6; and

Fig. 11 shows the form of a bag closed by the machine.

Referring first to Figs. 1, 2 and 4, the machine assembly has a frame structure including a horizontal conveyor chain support and guide plate 10 formed as shown in Fig. 4 to present a pair of parallel channels 10a, carried by such other parts of the frame structure as the legs 11, 12 and 13. Traveling within the channels 10a is a pair of endless conveyor chains 14 suitably driven as by the diagrammatically indicated sprockets 15 which in turn are driven by the motor 16. The support 10 may have an up-turned flange or guard 116, at the inside of which the bags 17 to be closed are placed side-by-side as in the arrangement shown in Fig. 1 for advancement on the conveyor

chains 14 to the closing mechanism generally indicated at 18. As will be understood, when placed upon the conveyors the bags have their open ends fully distended and projecting beyond the left-hand side of the conveyor as viewed in Fig. 4. And the bags will be filled to a portion of their length or depth, as for example to approximately the extent represented by the bulged portion of the bag in Fig. 4.

At this point it may be mentioned that whereas for convenience and simplicity of illustration, the entire machine assembly has been shown to be arranged or mounted in a position such that the support 10 is laterally horizontal, it may be desirable to mount the assembly shown in Fig. 4 in a manner such that the support inclines downwardly and outwardly toward the guard 116, thus tending to cause the bag contents to settle as the bags are advanced toward the closing mechanism 18. When so inclined, the machine may include a conveyor chain (shown only in Fig. 4) which will support the bottoms of the bags above the guard 116.

Anticipating that at times an individual bag may be overfilled to an extent such that its contents might enter between and interfere with proper functioning of the later described gathering wheels, we have provided a selectively responsive safety device, generally indicated at 19 in Figs. 2 and 3, which operates to discontinue the bag feed to the mechanism 18, in response to the overfilled condition of any individual bag. The device 19 comprises an offset endless chain 20 carried on sprockets 21 and 22, which serves simply to give bottom support for the neck portions of the advancing bags as they move beneath an arm 23 pivotally mounted at 24 on a suitable support 25, the arm having gravity repose over the chain 20 at a clearance therefrom determined by the setting of screw 26. Positioned directly above the arm 23 is a switch 27 in the circuit of the motor 16, and which has on-and-off actuation by an arm 28 directly overlying and engageable by the aforementioned arm 23. Normally, the neck portions of properly filled bags will pass between the top rung of chain 20 and arm 23 without displacing the latter, at least sufficiently to actuate the switch 27. However, an overfilled bag entering between the chain and arm will displace the latter together with arm 28, upwardly sufficiently to actuate the switch 27 and stop the operation of motor 16. Upon removing the offending bag, the levers, switch and motor restore to normal operating positions and conditions.

Referring now particularly to Figs. 2 and 4, the bag closing mechanism 18 is shown to comprise a drive mechanism, the form and details of which are subject to wide variation, but which typically may include an oscillating bearing sleeve 30 carried by a shaft 31 which in turn is journaled within bearings 32 secured to the horizontal frame pieces 33. Arm 34 fixed to the sleeve 30 carries at its upper end a sleeve 35 within which is journaled a shaft 36 carrying on one end a sprocket 37 driven by chain 38 passing over a sprocket 39 rotatable on the shaft 31. Chain 38 passes over an idler sprocket 40 near guide roller 41 carried by the oscillating arm 34. The prime mover comprises an electric motor 42 which drives sprocket 43 carrying a chain 44 extending about sprocket 45 carried by cam shaft 46 journaled in bearings 47 mounted to the up-rights 12. Shaft 46 carries a second sprocket 48 which through chain 49 and sprocket 50 drives the shaft 31.

The parts just described may be enclosed within a sheet metal housing 51, the side of which adjacent the conveyors 14 may be open, as shown in Fig. 4.

Bearing sleeve 35 carried on the upper end of the oscillating arm 34 carries a yoke structure which mounts the gathering wheels 52 and 53, this yoke structure comprising an upwardly extending U-shaped support 54 fixed to the sleeve 35 and carrying an outwardly extending member 55 having a right-angle end extent 56 in which is supported one end of a shaft 57, the opposite end of the shaft

being fixed to the upper leg of the support 54. Wheels 52 are free running on the shaft 57, and wheels 53 keyed to the shaft 36, are rotatably driven thereby. As illustrated in Fig. 10, wheels 52 are axially spaced apart and have peripheral annular projections 58, and wheels 53 are correspondingly spaced and have peripheral annular grooves 59 receiving the projections 58. Normally the wheel pairs 52 and 53 are peripherally interengaged, but are spreadable by reason of some flexibility in the yoke 54, sufficiently to permit the bag necks to pass between them. Spreading of the yoke arms is resisted by a coil spring 60 carried by bolt 61 extending through openings in the yoke, resistance to spreading of the yoke arms being variable by adjustment of nuts 62.

While passing between the wheels, the bag necks are guided and received between a pair of members 63 and 64, the former being stationarily and horizontally positioned, and member 64 being in the form of a lever pivoted to the frame at 65 and connected to coil spring 66 which resists upward displacement of the free end of the lever which is received between the wheels 52. As illustrated in Figs. 6 to 8 the members 63 and 64 (together with the wheels) form a convergent throat at 65 for reception of the bag necks within a clearance space at 66 at both outer sides of which the gathering wheels are in peripheral engagement. Forwardly of space 66 in the direction of bag travel, members 63 and 64 come against the later described tapes 67 and in so doing present at 68 a barrier at which the bag material is arrested while being completely gathered, and beyond which the gathered bag neck will not pass until the parts are displaced, as later described, to the Fig. 7 position.

Members 63 and 64 contain a pair of guide openings 69 through which the tapes are fed to the positions shown in Figs. 6 to 8, from a pair of reels 70 and 71. Either or both of these tapes may be pressure sensitive, having on their inner faces an adhesive which will cause adherence of the tape ends at opposite sides of the gathered neck 17a of the bag when the tapes are pinched together between the ends of the pressurizing members. As will be understood, these tapes will ordinarily be made of paper, plastic or other cellulosic material, low in cost and of sufficient strength to permanently hold the bag closed.

Positioned at the end of the upper pressure member 64 is a vertically reciprocable cut-off knife 72 carried on the end of an arm 73, see Fig. 2, pivoted to the frame at 74. This arm has an actuating link connection 75 with solenoid 76 which is in the electric circuit of a switch generally indicated at 77 in Fig. 4, which underlies the conveyor support 10. The assembly 77 comprises a depending bracket 78 carrying a switch 79 actuatable by arm E extending upwardly through an opening in support 10 so as to be engageable by each bag 17 as it passes over and depresses the arm. Downward displacement of arm 73 in response to actuation of solenoid 76 is resisted by coil spring 81 attached to the frame.

Shaft 46 carries a cam 82 which engages against roller 41 and oscillates the arm 34 in response to constant speed rotation of the shaft 46. The shaft also carries a pair of actuators 83, offset angularly from the maximum radii of the cams to engage in timed relation with oscillation of the arm 34 a micro-switch 84, see Fig. 5, in the circuit of switch 79 and solenoid 76.

To cite typical examples of certain dimensional and velocity conditions of significance in the operation of the machine: The wheels 52 and 53 each may have a diameter of 4 inches with the driven wheels 53 rotating at a speed of about 470 R. P. M. The driven wheels thus rotate at a fairly high speed and the wheels 52 rotate at about the same speed by virtue of their contact with the bags at such time as the latter are between the wheels during the closing operation. At the wheel interfaces between which the bags pass, the wheels have a throw on the arm 34 about the center of shaft 31 of about 1 1/4 inches, and the arm oscillates at a frequency of about 172 per minute.

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The conveyor 14 advances the bags to the wheels at a rate of about 50 feet per minute.

In considering the operation of the machine, assume the bags 17 to be placed in the previously described condition, upon the conveyor chains 14 and to be advancing toward the closure mechanism 18 as indicated in Figs. 1 and 4. Upon entering the throat at 65, see Fig. 6, to the point of engagement with the converging surfaces of the wheels 52 and 53, the leading edge of the bag is engaged between the irregular peripheral surfaces of the wheel with a grab-like suddenness, and the entire width of the bag neck is advanced with quick suddenness against the temporary block presented by the inwardly projecting end portions of the members 63 and 64.

During the time that the bag neck is thus being gathered, cam 82 acting against arm 34 bodily moves the wheels 52 and 53 forwardly to the Fig. 7 position (Fig. 9 illustrates the oscillatory travel of the wheels), in which the upper pressure member 64 is displaced against the resistance of spring 66 sufficiently to pass the gathered neck, while continuing however to exert a pinching pressure against the tape. Retractive movement of the wheels returns the parts to the Fig. 8 position in which the pressure members come together behind the advancing bag neck with pressures sufficient to form a tape seal at that point. The oscillatory throw of the wheels is so predetermined that the pressure members will pinch together a length of the tapes which is the same as the initially adhered tapes at the opposite or forward side of the neck. One of the arms 83 then engages the switch 84, see Fig. 5, to actuate the solenoid 76 and knife 72 to sever the tapes. The wheel assembly then continues its retractive movement in returning to the Fig. 6 position, from which the described cycle is repeated.

The function of switch 79, in circuit with the solenoid 76 and switch 84, is to prevent idle operation of the knife 72 when the machine is in operation without bags passing through the gathering wheels. At such time as the switch lever 80 is in raised position, the electrical circuit containing the solenoid 76 and switch 84 is open and the cutter 72 will not be operated. However, as switch 79 is closed upon depression of the lever 80 by an overriding bag 17, the circuit is closed and the knife operates to sever the tapes in accordance with the previously described cycle.

It is pertinent to observe that the capacity of the mechanism of Figs. 6 to 8 to rapidly close a succession of bags being fed through, is not dependent upon any predetermined spacing of the bags, or any spacing at all between them. In fact, the bags may overlap and yet be closed individually and in the manner previously described. The rapidity of the bag neck gathering and tape applying operation is sufficiently great to permit of the final closing operation upon one bag while a succeeding and overlapping bag is entering between the gathering wheels. The only requirement for independent gathering and closing of the two bags, is that the first be expelled from between the pressure members 63 and 64, and that the latter be returned to say their Fig. 8 positions sufficiently soon to block the on-coming bag edge. In this connection it may be mentioned that a succeeding and perhaps overlapping bag may enter between the gathering wheels during the return swing, i. e. at an intermediate point in the return oscillation stroke as depicted by Fig. 9, and finally become properly gathered and closed, so long as the oscillatory travel of the wheels will have acted to dispel the previously closed bag and permit restoration of the pressure members 63 and 64 to their obstructing engagement against the tapes.

We claim:

1. Apparatus for gathering and closing the neck portion of an initially distended and therefore open flexible bag, comprising bag advancing means forming a pair of opposed surfaces adapted to receive between them a side edge portion of the bag, drive means for moving one of said surfaces in a direction tending to advance the bag

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material between said surfaces, blocking means acting temporarily to block such advancement of the forward portion of the bag material being advanced so that the material is gathered back of the blocking means to a transversely reduced neck portion of the bag securable then in closed condition, and means in addition to said drive means for then producing relative movement of said advancing means and said blocking means in a direction causing said advancing means to move bodily relative to the blocking means in the direction of advancement of the bag while the advancing means are in engagement with a gathered bag neck to thereby advance said neck relative to the blocking means and thus free the neck.

2. Apparatus for gathering and closing the neck portion of an initially distended and therefore open flexible bag, comprising bag advancing means forming a pair of opposed surfaces in essentially circular form, both of said surfaces being rotatable and being adapted to receive between them a side edge portion of the bag, means for moving one of said surfaces in a direction tending to advance the bag between said surfaces, blocking means movable laterally of the path of advancement of the bag and acting temporarily to block such advancement of the forward portion of the bag material being advanced so that the material is gathered back of the blocking means to a transversely reduced neck portion of the bag then securable in closed condition, and means in addition to said drive means for producing bodily relative movement between said advancing means and said blocking means in a direction causing said advancing means to move bodily relative to the blocking means in the direction of advancement of the bag while the advancing means are in engagement with a gathered bag neck to thereby advance said neck relative to the blocking means and thus free the neck.

3. Apparatus for gathering and closing the neck portion of an initially distended and therefore open flexible bag, comprising bag advancing means forming a pair of opposed surfaces adapted to receive between them a side edge portion of the bag, drive means for moving one of said surfaces at high speed and in a direction tending to advance the bag between said surfaces, relatively movable blocking members receiving between them the advancing bag material and acting temporarily to block such advancement of the forward portion of the bag material being advanced so that the material is gathered back of the blocking means to a transversely reduced neck portion of the bag then securable in closed condition, and means in addition to said drive means for bodily moving said advancing means in said advancing direction while in engagement with a gathered bag neck to thereby free said neck from between said blocking members.

4. Apparatus for gathering and closing the neck portion of an initially distended and therefore open flexible bag, comprising bag advancing means forming a pair of opposed surfaces having an interfitting projection and recess and adapted to receive between them a side edge portion of the bag, drive means for moving one of said surfaces in a direction tending to advance the bag between said surfaces, blocking means acting temporarily to block such advancement of the forward portion of the bag material being advanced so that the material is gathered back of the blocking means to a transversely reduced neck portion of the bag then securable in closed condition, and means in addition to said drive means for producing bodily relative movement between said advancing means and said blocking means in a direction causing said advancing means to move bodily relative to the blocking means in the direction of advancement of the bag while the advancing means are in engagement with a gathered bag neck to thereby advance said neck relative to the blocking means and thus free the neck.

5. Apparatus as defined in claim 1, comprising also tape supporting means from which adhesive tape is fed to secure the gathered neck portion of the bag.

6. Apparatus as defined in claim 1, including also means for mechanically feeding a succession of bags between said bag advancing means surfaces.

7. Apparatus as defined in claim 1, including also feed means for mechanically feeding a succession of bags between said advancing means surfaces, and means operable in response to the overfilled condition of any individual bag approaching said surfaces for stopping movement of said feed means.

8. Apparatus for gathering and closing the neck portion of an initially distended and therefore open flexible bag, comprising bag advancing means forming circular surfaces adapted to receive between them a side edge portion of the bag, drive means for moving one of said surfaces in a direction tending to advance the bag between said surfaces, movable blocking means at one side of said surfaces and acting temporarily to block advancement of the forward portion of the bag material being advanced so that the material is gathered back of the blocking means to a transversely reduced neck portion of the bag then securable in closed condition, and means in addition to said drive means for bodily oscillating said bag advancing means to move alternately in said advancing direction and an essentially opposite returning direction while said one of the circular surfaces turns, said bodily movement in the advancing direction occurring while the bag neck is engaged by said advancing means so that said bodily movement correspondingly moves said neck relative to the blocking means in advancing direction and thus frees the neck.

9. Apparatus as defined in claim 8, in which said surfaces include two opposed pairs of wheels, and said blocking means is positioned between the peripheral surfaces of both pairs.

10. Apparatus as defined in claim 8, comprising means for supporting a roll of pressure sensitive tape from which the tape is fed to a location at which it is applied to the gathered neck of the bag, and means for severing the tape after it is applied to the bag.

11. Apparatus as defined in claim 8, in which said blocking means comprises a pair of relatively movable members, and yielding means urging one of said members toward the other.

12. Apparatus as defined in claim 9, in which said blocking means comprises means for guiding and applying pressure sensitive tape about the gathered neck of the bag.

13. Apparatus as defined in claim 9, in which said blocking means comprises a pair of relatively movable members receiving between them the advancing bag material, said members including means for guiding between the surfaces of said pairs elongated tapes one at least of which is pressure sensitive, and including also means for applying the tapes about the bag neck and pressing together end portions of the tapes, and additional means for then severing the applied tapes from the feed tape.

14. Apparatus for gathering and closing the neck portion of an initially distended and therefore open flexible bag, comprising bag advancing means forming two opposed pairs of spaced surfaces adapted to receive between them a side edge portion of the bag, means for moving one of said pairs of surfaces in a direction tending to advance the bag between said surface pairs, movable blocking means between the surfaces of both pairs acting temporarily to block such advancement of the forward portion of the bag material being gathered, securing means operating in timed relation with said blocking means for securing the bag neck in closed condition, and means for oscillating said advancing means in said advancing direction and in relation to said blocking means to free the closed bag, said blocking means comprising a pair of relatively movable members extending between the surfaces of said pairs and yielding means resisting movement of one of said members away from the other, said members comprising means for directing between

their surfaces a pair of elongated tapes one at least of which is pressure sensitive and the members being operable to press together end portions of the tapes about the bag neck, and means for then severing the applied tapes from the feed tape.

15. Apparatus as defined in claim 14, including also feed means for mechanically feeding a succession of bags between said bag advancing means surfaces.

16. Apparatus for fastening closed the gathered neck of a flexible bag comprising a pair of pressure members movable relatively toward and away from each other and forming a restriction through which the gathered neck of said bag is advanced, means for feeding two tapes at least one of which is pressure sensitive between said pressure members at opposite sides of said bag neck, means yieldingly urging said members relatively toward one another and against said tapes as the tapes and neck advance between the members to thereby fasten the neck in closed condition by means of the tapes, and means for cutting off the portions of said tapes which are fastened to a bag neck after movement of those tape portions and the neck between said members, said members having aligned transverse surfaces beyond said restriction, and said cutter means comprising a cutter movable along said transverse surfaces and across the tape path.

17. Apparatus for fastening closed the gathered neck of a flexible bag comprising a pair of pressure members movable relatively toward and away from each other and forming a restriction through which the gathered neck of said bag is advanced, means for feeding two tapes at least one of which is pressure sensitive between said pressure members at opposite sides of said bag neck, means yieldingly urging said members relatively toward one another and against said tapes as the tapes and neck advance between the members to thereby fasten the neck in closed condition by means of the tapes, said members containing guide slots through which said tapes pass to inner sides of the members to then advance along those inner sides and between the members.

18. Apparatus for fastening closed the gathered neck of a flexible bag comprising a pair of pressure members movable relatively toward and away from each other and forming a restriction through which the gathered neck of said bag is advanced, means for feeding two tapes at least one of which is pressure sensitive between said pressure members at opposite sides of said bag neck, means yieldingly urging said members relatively toward one another and against said tapes as the tapes and neck advance between the members to thereby fasten the neck in closed condition by means of the tapes, means stationarily mounting one of said members, and means mounting the other member for swinging movement toward and away from the first, said means urging the members relatively together comprising a spring yieldingly urging said other member toward said one member, said members having first converging portions forming an entrance throat, and having essentially parallel portions beyond the throat for pressing the tapes against the bag neck.

19. Apparatus as recited in claim 18, in which said members contain slots for passing said tapes to inner sides of the members, said apparatus including a cutter element beyond said parallel portions of the members for cutting off the tapes.

20. Apparatus for fastening closed the gathered neck of a flexible bag comprising a pair of pressure members movable relatively toward and away from each other and forming a restriction through which the gathered neck of said bag is advanced, means for feeding two tapes at least one of which is pressure sensitive between said pressure members at opposite sides of said bag neck, means yieldingly urging said members relatively toward one another and against said tapes as the tapes and neck advance between the members to thereby fasten the neck

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in closed condition by means of the tapes, and means for advancing said bag neck between said members.

21. Apparatus as recited in claim 20, in which said two pressure members form together a tapering throat for directing the neck therebetween.

22. Apparatus as recited in claim 20, including means for cutting off the portions of said tapes which are fastened to a bag neck after movement of those tape portions and the neck between said members.

23. Apparatus as recited in claim 20, including a cutter 10

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for cutting off said tapes after passage between said members, and means for actuating said cutter in accordance with advancement of the bag neck between said members.

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