

Aug. 24, 1965

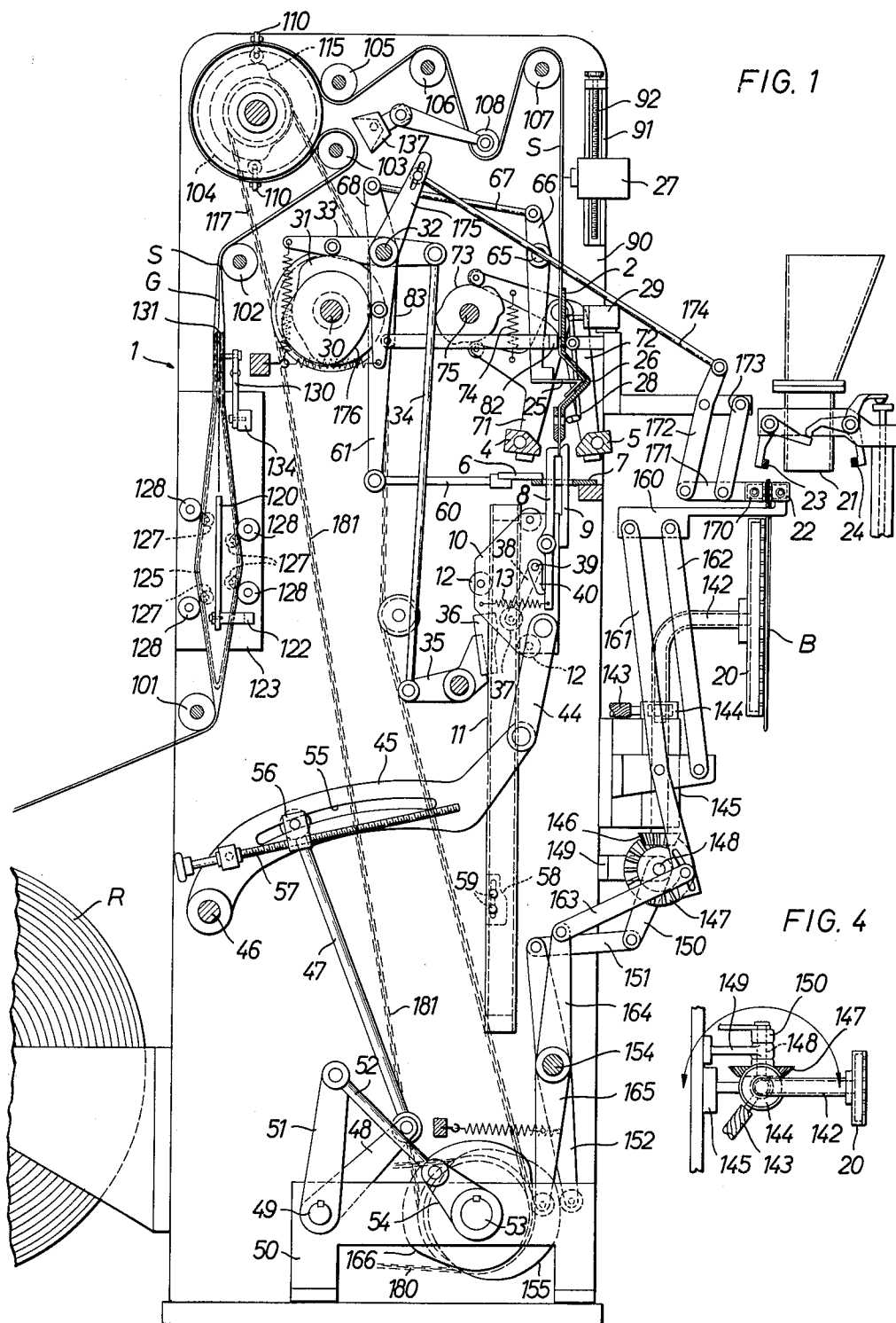
P. LOHSE ETAL

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BAG FILLING AND CLOSING MACHINE

Filed May 1, 1962

3 Sheets-Sheet 1



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BAG FILLING AND CLOSING MACHINE

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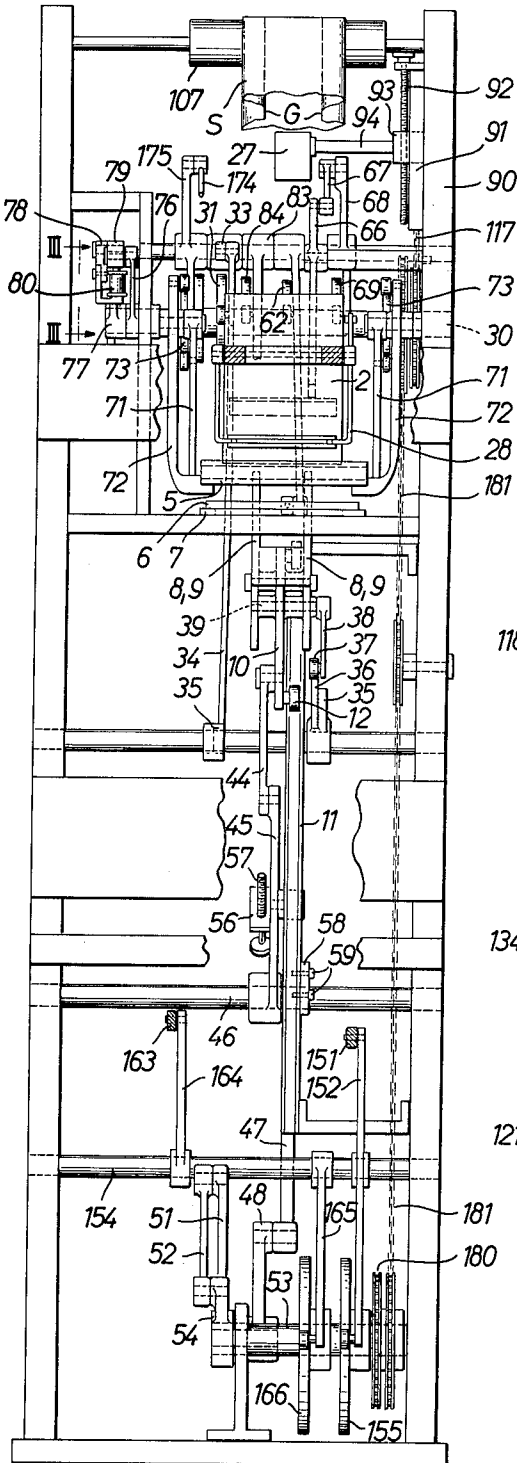


FIG. 2

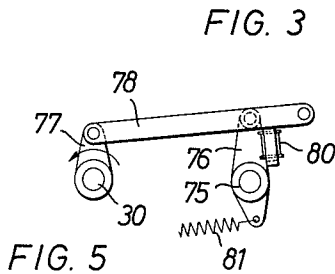


FIG. 3

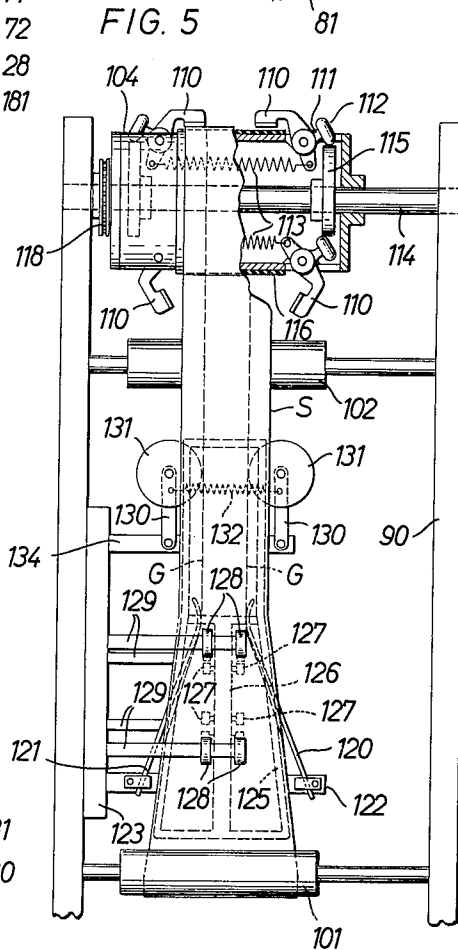


FIG. 5

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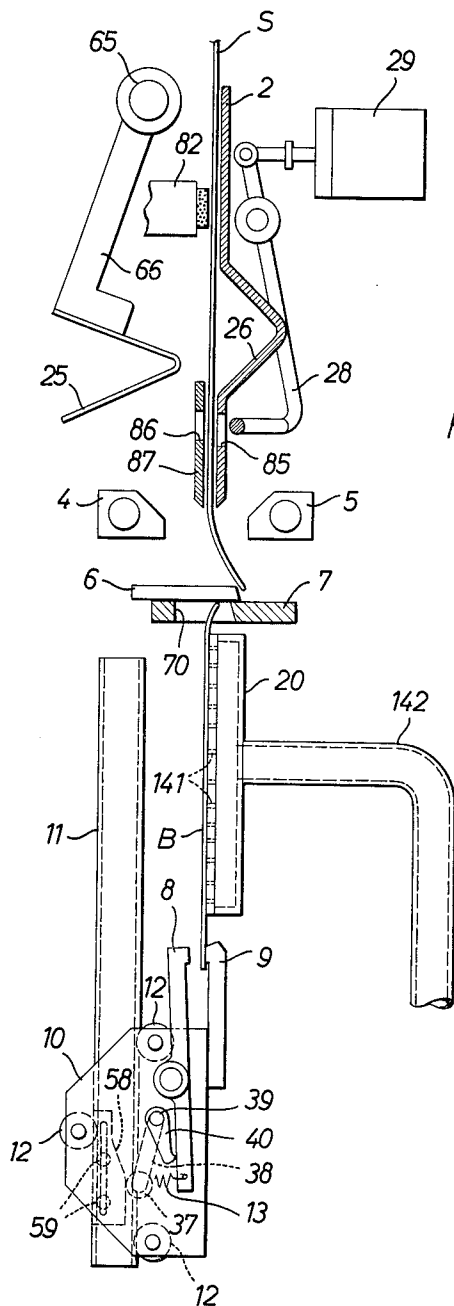
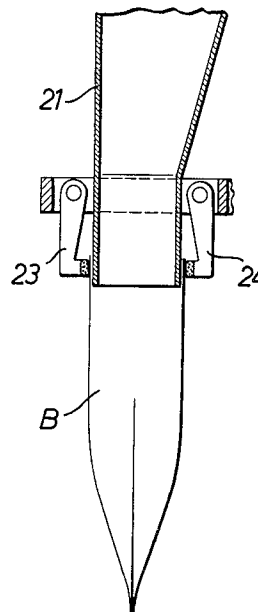


FIG. 6



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BAG FILLING AND CLOSING MACHINE

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H 42,499

9 Claims, (Cl. 53—187)

This invention relates to bag filling and closing machines, and in particular to apparatus in such machinery for forming the bags from polyethylene or similar non-rigid, heat sealable packaging materials.

An object of the invention is to establish apparatus of this kind which can be arranged directly in advance of the filling and closing devices of the machine so as to take the non-rigid packaging material, which can only be handled with difficulty, from the reel and form it into bags, thereafter transferring it to the filling and closing devices.

A further object is an arrangement whereby the bag material is conveyed suspended to the operating tools and the finished bags are likewise conducted in suspended condition to the filling and closing devices of the machine, so that the soft packaging material dealt with, particularly in the case of plastics foils, is transported through the various make-up and filling stages without difficulty despite any limpness and instability.

Yet another object is an apparatus of this character which is devised so that the bag formation is positive and the actions of the instrumentalities participating in this manufacture are synchronized by operation from a common source.

Yet another object is provision in the apparatus for ready adjustment of bag length and quick correction of the registration of printing on the bags.

In summary, this invention lies in the use, in a machine for filling and closing bags, of bag-forming apparatus comprising means for guiding a continuous length of non-rigid, flattened tubular, heat-sealable bag material in a descending path to heat sealing tools for applying a transverse weld seam at intervals to said bag material, a cutter device disposed below said tools for severing the length of bag material into individual bag blanks, means for engaging the leading end portion of the length of bag material and for drawing it vertically downwards past said cutter device prior to the cutting operation, and a transfer mechanism arranged for engagement, by suction, of the end portion of the bag when fully drawn down in vertical status and cut off to form a bag blank, and for transferring it to a filling station of the machine.

Other objects and features of the invention will hereinafter appear.

A preferred embodiment of apparatus according to this invention is described below with reference to the accompanying diagrammatic drawings, in which:

FIGURE 1 is a cross section through the apparatus,

FIGURE 2 is a front view of this apparatus, the mechanism for transferring the bags being omitted,

FIGURE 3 is a detail of the parts, as seen on the line III—III of FIGURE 2,

FIGURE 4 is a plan view of the transfer mechanism,

FIGURE 5 is a front view of an assembly for forming gusset folds in a length of tubing, and

FIGURE 6 is a diagrammatic representation of part of the apparatus of FIGURE 1, seen on a larger scale.

The apparatus illustrated in the drawings is designed for the production of bags, designated B, from layflat tubing S of polythene or similar non-rigid, heat sealable

packaging material. This apparatus comprises a frame 1, mounted on a bracket of which is a supply reel R for the layflat tubing. This tubing runs from the reel via a series of guide rolls and other instrumentalities, which will be described in more detail below, upwards and then across the top of the frame, so as to descend eventually, in a generally vertical direction, past a guide 2 to be provided with a heat sealing seam and divided into separate bag blanks.

The first step in the bag formation is the formation of a transverse weld seam at the leading end of the tubing S by means of the heated sealing jaws 4, 5 and then a specific length of this leading end is pulled down and cut off by a severing device 6, 7 to form a flat bag B. This forward draw of the end of the tubing is accomplished by a pair of nippers 8, 9 which is movable vertically along the path of travel of the end of the tubing, being mounted on a carriage 10 which can be reciprocated up and down on a fixed rail 11, through the agency of rollers 12, periodically and in timing with other operations of the apparatus (see below).

When the nippers 8, 9 are in their upper position (see FIGURE 1) the nipper jaw 8, which is pivotally mounted on the slide 10 and is under the action of a spring 13, is pivoted against the jaw 9, whereby the nippers grip the leading end of the tubing. This rocking movement is initiated periodically, and in timed relation with the other movements of the apparatus, by an edge 31 which is fastened to a continuously rotating main operating shaft 30 of the machine, rotatable on the frame 1. In contact with this cam 31 is a lever 33 which is pivotally mounted on a spindle 32 and is articulated through a link 34 with a pivotal lever 35. Secured to the lever 35 is a cam piece 36 and this is contacted by a roller 37 on a lever 38, pivotally mounted on the slide 10, when the latter is in its uppermost position. Rigidly connected to the lever 38, or the mounting pin 39 thereof, is a finger 40 which bears against the lower part of the nipper jaw 8.

The timing of cam 31 is such that the cam piece 36 is brought thereby into its forwardmost position when the nipper carriage 10 moves upwards, whereby the roller 37 of the lever 38 runs on to cam piece resulting in the nipper jaw 8 being rocked away from the jaw 9 to allow for gripping of the leading end of the tubing. When the nippers have reached their upper dead center position, the cam piece 36 is swung back, so that the nipper jaw 8 closes again under the action of the spring 13 and the tubing is gripped by the nippers, ready to be drawn down.

To allow for this latter action, the carriage 10 is articulately connected to a rocker arm 45 through a link 44. This rocker arm 45 is mounted on a spindle 46, and is coupled by a tie bar 47 with a rocking lever 48 which is mounted by a pivot pin 49 in a bearing 50. Also firmly connected to the pin 49 is a lever 51 which is articulated through a link 52 with a crank arm 54 fastened to a continuously rotating shaft 53. With this arrangement, rotation of the crank 54 results in rocking of the arm 45 and vertical reciprocation of the carriage 10.

The stroke of the carriage 10 is adjustable to allow for adjustment of the length of draw of the tubing S per carriage stroke to a chosen figure, i.e. for adjustment of the individual bag length. To provide for this, an arcuate slot 55 is provided in the rocker arm 45 and a follower 56 is displaceably mounted in this slot. This follower 56, to which the link 47 is pivotally connected, can be set in any adjusted position, corresponding to the required length of bag, by means of a threaded rod 57 provided on the rocker arm 45.

As the nippers 8, 9, reach their lower dead center and before the rocker arm 45 returns with an anti-clockwise movement to move the carriage 10 up again, the roller 37 of the lever 38 runs on to a fixed cam piece 58 (FIG-

URE 6), as a result of which the nipper jaw 8 is opened again. The cam piece 58 is adjustably fastened to the rail 11 by means of screws 59. At this stage, i.e. with the end of the tube pulled down, the leading part of the tubing, released from the nippers, is held by means of suction against a vacuum plate 20 and is severed by means of the cutter device 6, 7.

The cutter device used for this purpose comprises a fixed anvil plate 7, which is provided with a slot to allow for the passage therethrough of the nippers 8, 9 and the tubing S, and a movable knife 6 which cooperates with this plate 7 and slides thereon during the cutting operation. This knife 6 is secured to an arm 60 which is pivotally connected to a lever 61 rotatably mounted on the spindle 32 and adapted to be rocked periodically and in timing with the remaining machine movements, by an edge cam 62 also secured on the main operating shaft 30.

As will be observed the cutter device 6, 7 is the next instrumentality to follow the heat sealing jaws 4, 5 in the path of the tubing, and to prevent this device being overheated by the heat sealing jaws, in the present example it is arranged some distance below these jaws. The aim is to prevent an adhesion of the two applied walls of the tubing at the part where the cut is made, as a result of excessive heating up of the knife, thereby making it difficult or impossible to open this trailing end of the severed bag.

Normally the spacing between the sealing jaws would determine the distance of a bag between the leading cut edge and the bottom sealing seam. To keep this surplus of bag material as short as possible, in the machine now being described the leading end of the tubing after the severing cut has been made, is pulled back from the cutter device 6, 7 to the zone of the heat sealing jaws before the welding seam is made by the latter. This action is performed by a pivotable, knee-forming deflector 25 which, after the cut has been made, pushes the new leading end of the parent tubing stock S into an angled re-entrant 26 in the guide plate 2, thereby causing the lower end edge of the tubing S to be pulled up the requisite amount.

The deflector 25 is fastened to a lever 66 which is mounted for pivoting about a pivot 65 on the frame 1 and is connected by a link 67 to an operating lever 68 mounted on the spindle 32. The periodic working movements of the lever 68 and the deflector 25 are produced by an edge cam 69 which is also mounted on the main operating shaft 30.

The tubing S is held, above the re-entrant portion 26 of the guide plate 2, during the retraction of the end of the tubing by a movable clamping plunger 82 arranged opposite the guide plate 2 and linked to an operating lever 83 which is mounted on the spindle 32 and is operable by a further edge cam 84 on the main operating shaft 30.

Whilst the deflector 25 holds the end of the tubing in the retracted position, the heat sealing jaws 4, 5 are temporarily closed together, thereby to press the end of the tubing between them and to transfer welding heat thereto. To provide for the requisite movement of the sealing jaws, the latter are fastened to rockable pairs of levers 71, 72 which, at one end, are held by a spring 74 in contact with two double-cam plates 73. These latter are secured on a shaft 75 which also has fastened thereto a lever 76 (FIGURE 3) which is periodically rocked by means of a crank 77 also secured to the main operating shaft 30.

To arrange that the sealing jaws 4, 5 shall immediately move apart in the event that the apparatus comes to a standstill, thereby to protect the bag material, the transmission between the crank 77 and the lever 76 is made for automatic release and uncoupling in such a situation. To this end a rockable arm 78 is pivotally attached to the crank 77 and this is pivotally connected by a tie 79 to the lever 76. When the apparatus is running the rockable arm 78 and the tie 79 are held firmly together by an electromagnet 80, secured to the rocker arm 78 and in cir-

cuit with the prime mover of the apparatus, and the coupling between the crank 77 and lever 76 is rigid. When this circuit is de-energised, that is to say when the apparatus is switched off, the electromagnet 80 releases the tie 79 so that the double cam plate for the sealing jaw control immediately returns to a position in which the jaws 4, 5 are out of contact with the tubing S, under the impulse of a draw spring 81 engaging the lever 76.

To ensure that, in the case of pre-printed bag material, the printed data for the individual bags is correctly registered in the cutting and welding operations, a photo-electric scanning unit 27 of commercially known type, and a correcting device which is controlled by this detector unit, are provided along the path of the tubing. This correcting device comprises a rockable pusher stirrup 28 and an electromagnet 29 operating the latter.

This mechanism operates synchronously with the forward draw on the tubing, and this is arranged always to advance a small amount more than the actual intended bag length in such a way that, should datum markings on the tubing S be found out of place, the tubing S will be drawn back an appropriate amount, as a result of the rocking of the stirrup 28, before the nippers 8, 9 pull the tubing forward through a fresh blank length. In applying the correction to the forward draw of the tubing, the offset lower end of the stirrup 28 passes into a slot 85 in the guide plate 2 and pushes the tubing S into a slot 86 in a further guide plate 87 arranged opposite to plate 2.

The detector unit 27 is arranged for vertical adjustment on the frame 1 to allow for adjustment to a specific mark on the tubing S. For this purpose a rail 91 is fastened to a side wall 9 of this frame, and a block 93, which can be shifted by a screwed rod 92, is arranged for displacement in a groove in this rail. This block 93 carries an arm 94 on which the detector unit 27 is arranged (see FIGURE 2).

In the apparatus particularly illustrated in the drawings, the tubing S is drawn continuously from the supply reel R in flat condition over three guide rollers 101, 102, 103 by means of a draw drum 104, whence it is conducted to the grippers 8, 9 via further guide rollers 105, 106, 107, with a jockey roller 108 arranged between them. To prevent the tubing S slipping on the drum 104, the latter is provided with a rubber layer 116 and has two pairs of clamping pads 110 pivotally mounted therein. These pads have arms 11 carrying rollers on cams 115 secured to a fixed shaft 114 and are urged out of contact with the surface of the drum by springs 113. The arrangement is that the cams 115 are designed to operate the pads against the action of springs 113 so that the tubing is engaged by the pads at the time it is actually in contact with the surface of the drum. This is over the major part of the drum by virtue of the positioning of the guide rollers 103 and 105. The drum 104 is rotatably mounted on a shaft 114 and has a toothed wheel 118 which is driven from the main operating shaft 30 through a chain 117.

In the example illustrated, gusset folds G are also formed in the tubing S during its travel. To this extent, a gusset forming device is provided between the guide rollers 101 and 102 and comprises a core in the form of a so-called "fish" 125 which slides within the tubing S, and folding fingers 120, 121. These latter are mounted on an arm 122 which in turn is fastened to a plate 123 on a side wall of the frame. The fish 125, to make it of light weight, of skeletal form only, i.e. is a frame of double wedge construction. The two central webs 126 thereof have four pairs of rollers 127 which cooperate with four fixed roller pairs 128, disposed externally of the tubing surrounding the fish 125, so as to hold the fish in position. The roller pairs 128 are mounted on arms 129 which are secured to the plate 123.

The tubing is first opened to rectangular cross section by the fish and the narrow sides of this rectangle are

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then continuously tucked in by the folding fingers 120, 121. Two circular discs 131, which are rotatably mounted on arms 130 pivotally mounted on a carrier 134 secured to the plate 123, engage in the gussets G thereby formed and locate the fish 125 in the plane of the tubing. The two discs 131 are pulled into the gussets G of the tubing S by the action of a spring 132 which engages arms 130.

To fix the gussets G in the case of a limp bag material, a radiant heater 137 is arranged opposite the guide roller 103 and the tubing S running thereover is continuously warmed by the radiant heat so that there is a kind of "ironing" of the tubing, which is drawn taut at this point.

Each bag B, having been severed from the tubing S and engaged by the vacuum plate 20 as described above, is turned through 180° by this plate and brought between two suction bars 22 and 170 which apply suction to the mouth of the bag and open it, to allow the nozzle 21 of a filling apparatus to be introduced into this mouth. This nozzle has two clamping jaws 23, 24 which press the walls of the bag firmly against the nozzle during the filling.

The vacuum plate 20, which comprises a hollow casing provided with openings 141 at its face, is secured to a pipe 142, with a right angled bend, through which a vacuum is applied through a length of tubing 143 and a coupling sleeve 144. The pipe 142 is mounted for pivoting about its vertical axis in a vertical bearing 145. A bevel wheel 146 is secured to its lower closed end and is in mesh with a bevel pinion 147 secured on a shaft 148 which, at its other end, mounted in a bearing block 149, has a lever 150 fastened thereto, this being coupled through a tie bar 151 with an operating lever 152. This lever 152 is rockable about a pivot 154 and is in engagement with a cam 155 mounted on the shaft 53. The cam 155 controls the rotary movement of the vacuum plate 20 so that, for each working step of the machine, this plate turns forwards and back 180° between its bag engagement and bag transfer positions.

The suction bar 22 is arranged for displacement in a horizontal plane to enable it to carry the part of each bag B engaged thereby beneath the filling nozzle 21. It is mounted on an arm 160 which is pivotally connected to a lever 161 and a link 162. The lever 161 is pivotally connected by a link 163 to a lever 164 which is fulcrumed on the shaft 154. Also secured to the shaft 154 is a further lever 165 in engagement with an edge cam 166 on the shaft 53.

The other suction bar 170 is similarly arranged for movement in the horizontal plane and for this purpose is secured to an arm 171 which is pivotally connected to a lever 172 and a link 173. Lever 172 is articulated through a rod 174 with a control lever 175 which in turn is in contact with a cam 176 also mounted on the shaft 30.

Thus, rotation of shafts 30 and 53 will, through the cams and linkages described, cause the engaged bag to be opened out around the nozzle 21. This is arranged to dip into the open mouth and, in so doing, causes the clamping pads 23, 24 associated therewith, to press the bag around the nozzle.

The shaft 53 is driven through a chain 180 from the prime mover (not shown). This drive is transmitted to the main operating shaft 30 by a further chain 181, and from this to drum 104 by chain 117. This arrangement synchronizes the operation of all the moving parts of the apparatus.

It is emphasized that the machine with the details particularly described and illustrated is an example only of the implementation of this invention, and that changes can be made therein without departing from the purview of the invention. Thus, for example, instead of fabricating bags from tubing, as in the specific example described, the starting material can be a web of plastic sheeting and the apparatus can incorporate, or have asso-

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ciated therewith a means, of which there are various examples available, for forming the web into a tube, and securing it with a welded or cemented longitudinal seam, before it undergoes the various operations described above.

Again, it will be understood that, with the apparatus described, it is possible to form bags which are without gusset folds. In this event it only requires the gusset forming assembly to be removed from the machine.

We claim:

1. In a machine for filling and closing bags, bag-forming apparatus comprising a support, a guide plate on said support, said guide plate having an angled re-entrant portion, a deflector arm pivoted on said support and having an angled portion opposite said re-entrant portion of the guide plate, means for periodically operating said deflector arm thereby to take up bag material into said re-entrant portion, a pair of heat sealing jaws disposed vertically below said guide plate on arms pivoted on said support, means for opening and closing said heat sealing jaws to form a transverse weld seam in the bag material, a cutter device comprising a knife and anvil arranged on said support vertically below said heat sealing jaws, means for periodically operating said cutter device to sever individual bag blanks from the bag material, a nipper device to engage a leading end portion of the bag material, means for reciprocating said nipper device in a vertical path past the cutter device and a transfer mechanism for conveying a severed bag laterally from beneath said cutter device.

2. Bag-forming apparatus as claimed in claim 1, in which the opening means for said pins include an electromagnetic link which is adapted to uncouple the drive to said jaws whereby the same are opened on cessation of bag travel.

3. Bag-forming apparatus as claimed in claim 1, in which said transfer mechanism comprises a vertically-disposed suction plate which is disposed with its upper edge at a level immediately below the cutter device and is mounted for arcuate reciprocation about a vertical axis horizontally spaced from the main plane thereof, thereby to convey a severed bag away from the cutting zone in a horizontal path, to a filling zone, and presentation means for engaging a bag in this filling zone, and opening the mouth thereof for reception of a filling nozzle.

4. Bag-forming apparatus as claimed in claim 3, in which said presentation means comprise hollow bars connected to a suction source and parallelogram linkage systems mounting the bars on said support.

5. Bag-forming apparatus as claimed in claim 4, further including clamping jaws associated with said bars for clamping the walls of a bag mouth against a filling nozzle projecting thereinto.

6. The invention as recited in claim 1 wherein a photo-electric scanning unit is disposed on said support adjacent said guide plate, a registration-correction device having electromagnetic means operatively controlled by said scanning unit, and a pivoted lever activated by said electromagnetic means to withdraw the severed end of the bag material a specified distance from said cutter device.

7. In a machine for filling and closing bags, bag-forming apparatus comprising a support, a bag material supply reel on said support, a bag material feed drum rotatably mounted on said support, clamping devices on said feed drum, cam means operating said clamping devices in response to rotation of said drum whereby a bag material is pressed flat against said drum, guide rollers conducting bag material to, around, and away from said feed drum, a guide plate on said support in the path of bag material forwarded by the latter for guiding the bag material in a flattened condition, a pair of heat sealing jaws disposed vertically below said guide plate on arms pivoted on said support, means for opening and closing said heat sealing jaws, to form a transverse weld seam in the bag material, a cutter device comprising a knife

and anvil arranged on said support vertically below said heat sealing jaws, means for periodically operating said cutter device to sever individual bag blanks from the bag material, a nipper device to engage a leading end portion of the bag material, means for reciprocating said nipper device in a vertical path past the cutter device and a transfer mechanism for conveying a severed bag laterally from beneath said cutter device.

8. In a machine for filling and closing bags, bag-forming apparatus comprising a support, a bag material guide means on said support for guiding bag material in a flattened condition, a heat sealing unit mounted on said support below said guide means, means for opening and closing said heat sealing unit to form a transverse weld seam in the bag material, a cutter device fixed on said support below the heat sealing unit, means for periodically operating said cutter device to sever individual bag blanks from the bag material, a vertical trackway on said support below said cutter device, a carriage movable on said trackway, gripper arms, at least one of which is pivotable, on said carriage, fixed cam means on said support for operating said pivotable gripper arm in response to the travel of said carriage, means for reciprocating said carriage on its trackway, and a transfer mechanism for conveying a severed bag laterally from beneath said cutter device, said carriage reciprocating means including a rocker arm operatively connected to said carriage, a driving eccentric and a link coupling said eccentric to said rocker arm, said link being adjustably connected to said rocker arm for variation of the stroke of said carriage.

9. In a machine for filling and closing bags, bag-forming apparatus comprising a support, a bag material guide means on said support, a heat sealing unit mounted

on said support below said guide means, means for opening and closing said heat sealing unit to form a transverse weld seam in the bag material, a cutter device fixed on said support below the heat sealing unit, means for periodically operating said cutter device to sever individual bag blanks from the bag material, a nipper device to engage a leading end portion of the bag material, means for reciprocating said nipper device in a vertical path past the cutter device, a gusset-forming assembly carried by said support in advance of said guide means, said assembly comprising an inner core of double wedge form and finger blades applied externally to bag material threaded over said core, a transfer mechanism for conveying a severed bag laterally from beneath said cutter device, and radiant heater means and roller means positioned on said support after the gusset forming assembly to apply heat to the bag material as it passes in taut condition over the roller means whereby gusset folds are ironed into a limp bag material.

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