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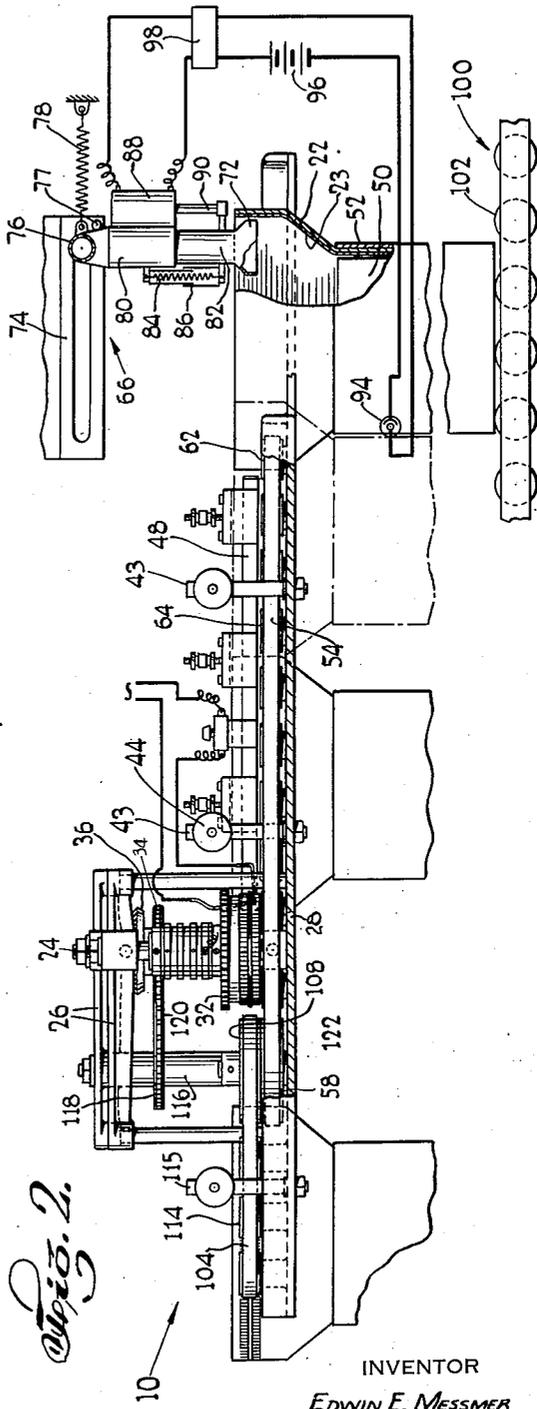
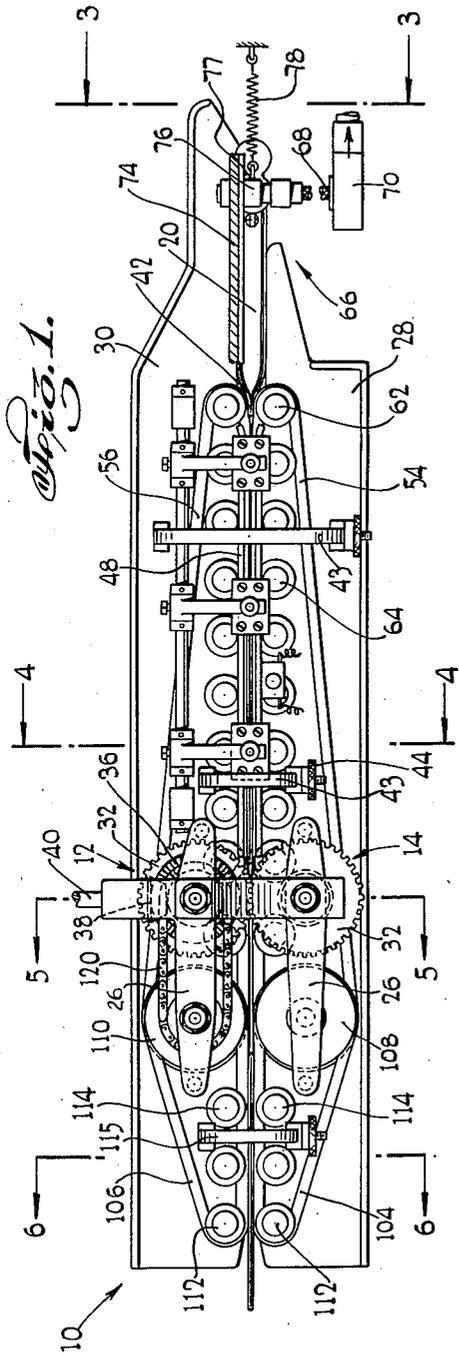
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2,410,834

MACHINE FOR SEALING BAGS

Filed Dec. 11, 1943

3 Sheets-Sheet 1



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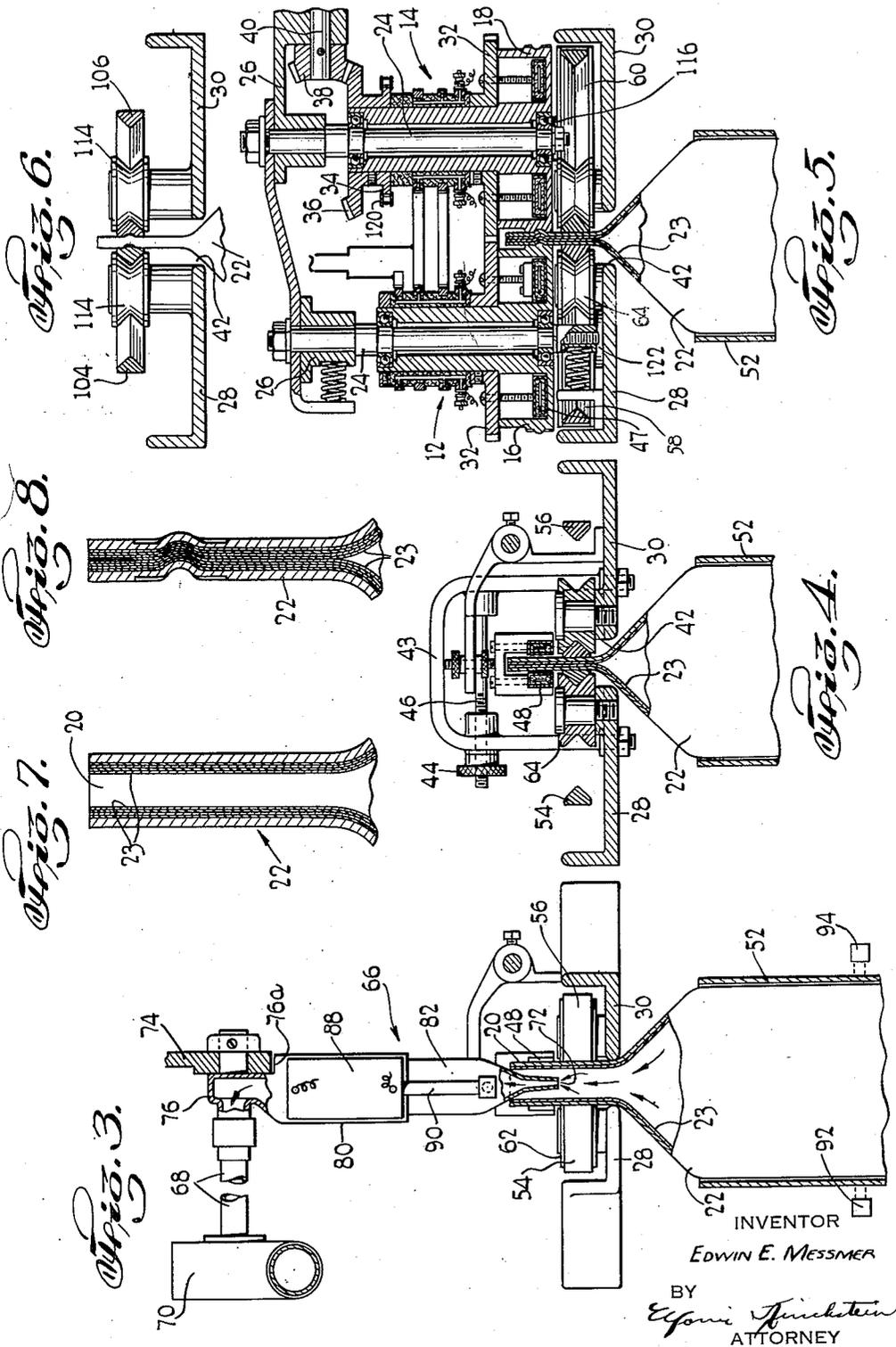
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3 Sheets-Sheet 2



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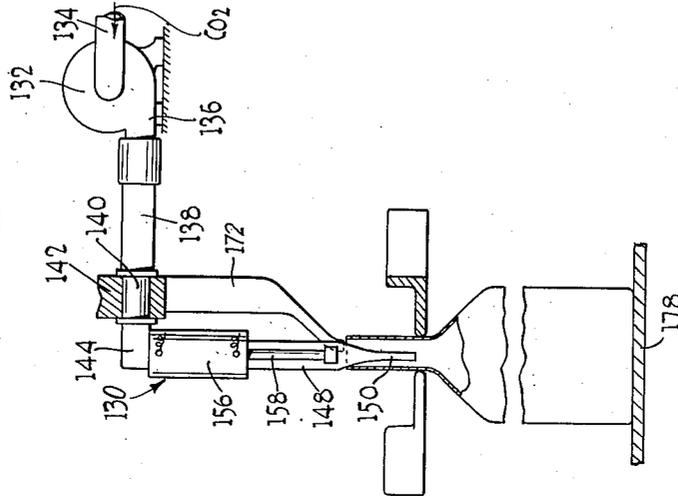
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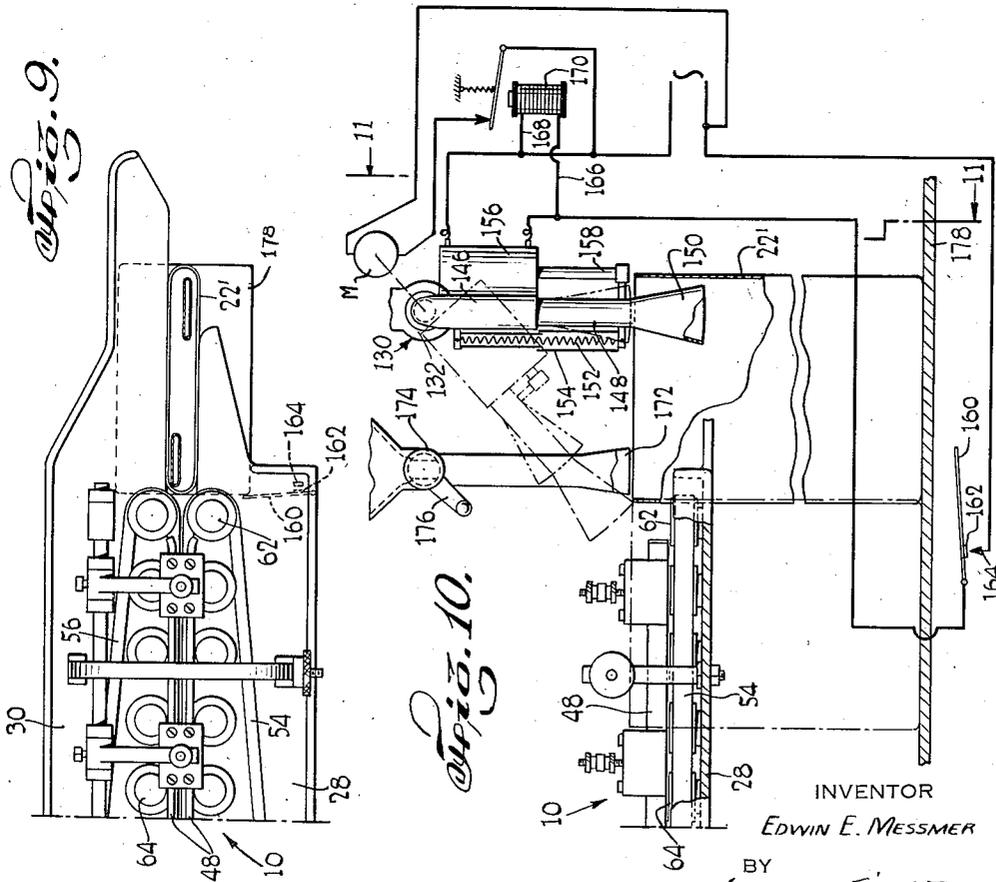
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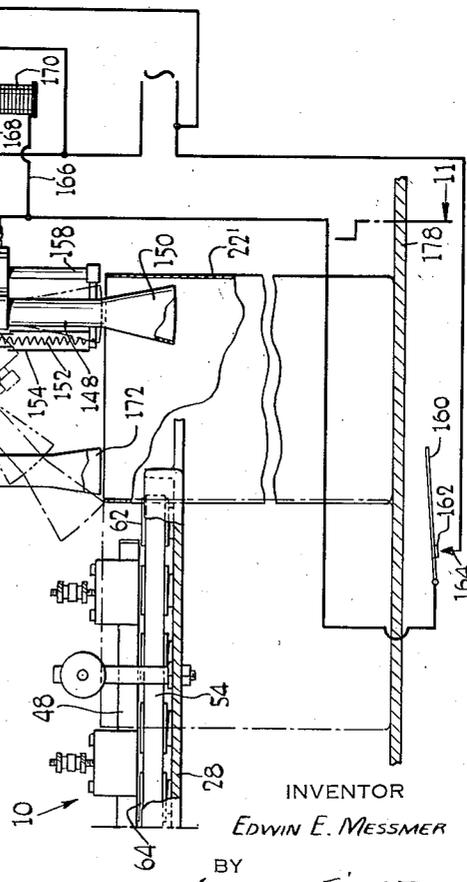
*Fig. 11.*



*Fig. 9.*



*Fig. 10.*



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# UNITED STATES PATENT OFFICE

2,410,834

## MACHINE FOR SEALING BAGS

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Application December 11, 1943, Serial No. 513,819

11 Claims. (Cl. 226-56)

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This invention relates to machines for sealing bags or like enclosures. More particularly the invention pertains to machines in which the air in the bags is removed prior to sealing.

One of the objects of the invention is to provide a machine of the character described which, after the air in the bag is removed, will in a simple manner prevent more air from reentering the bag until the bag has been sealed and the seal firmly set. Generally I attain this object by pressing together the walls of the bag mouth above or below the sealing zone from the time that air is removed until the seal is completed and, preferably, also set.

Another object of the invention is to provide in a machine of the character described, an air removing means which continues to function until the walls of the bag mouth are pressed together prior to sealing thereof. In this connection, a more specific object of the invention is to provide in a machine of the character described an air removing means which is automatically rendered ineffective and moved away from the mouth of the bag just before the walls thereof are substantially closed.

A further object of the invention is to provide in a machine of the character described an air removing means which is automatically rendered effective when the bag is properly positioned relative thereto.

A machine of the character aforementioned can be employed in various manners depending upon the nature of the air removing means, which may remove air either by extraction or by displacement.

In packaging certain types of goods, it is desirable to have the bag and its contents occupy as small a space as possible. Although some of the air in the bag is displaced when the bag is filled and a little more expelled by pressing the sides of the bag together, ordinarily sufficient residual air is nevertheless left to prevent the bag and its contents from occupying a minimum space. It is, therefore, a more particular object of the invention to provide in a sealing machine of the character described a removing means which will extract most of the residual air prior to sealing of the bag and thus cause the same to cling to its contents. In general terms this object of the invention is accomplished by pumping

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air out of the bag after the same has been filled to thereby exhaust the air between the bag and its contents and thus collapse the bag.

In packaging other types of goods, particularly products which are deleteriously affected by air, it is desirable to replace the air with an inert gas such, for example, as carbon dioxide. Heretofore bags so filled have admitted some air subsequent to filling with carbon dioxide and prior to sealing of the bag mouth. It is, therefore, a further object of the invention to provide a sealing machine of the character described in which an inert gas is pumped into the bag and the bag is sealed before any air has had a chance to leak thereinto.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts which will be exemplified in the constructions hereinafter described, and of which the scope of application will be indicated in the claims.

Certain novel features of the machine herein shown and described, but not claimed, are shown and described and claimed in a copending application for Machines for sealing bags, Serial No. 513,806, filed December 10, 1943, by George E. Boucher and myself, the said copending application and the instant invention being owned by a common assignee.

In the accompanying drawings, in which are shown various possible embodiments of my invention,

Fig. 1 is a top plan view of a bag sealing machine embodying my invention;

Fig. 2 is a side elevational view thereof in partial section;

Fig. 3 is an enlarged sectional view of the air extraction means taken substantially along the line 3-3 of Fig. 1;

Fig. 4 is an enlarged sectional view of the preheating means taken substantially along the line 4-4 of Fig. 1;

Fig. 5 is an enlarged sectional view of the pressure and heat sealing means taken substantially along the line 5-5 of Fig. 1;

Fig. 6 is an enlarged sectional view of the seal setting means taken substantially along the line 6-6 of Fig. 1;

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Fig. 7 is an enlarged vertical front-to-back sectional view through the open mouth of a bag prior to sealing;

Fig. 8 is a similar view through the mouth of the bag after sealing;

Fig. 9 is a fragmentary top plan view of the entrance end of a bag sealing machine embodying a modified form of the invention;

Fig. 10 is a side elevational view thereof in partial section, and

Fig. 11 is a sectional view of the air displacing means taken substantially along the line 11-11 of Fig. 10.

In general I accomplish the several objects of my invention by providing a bag sealing machine having means for sealing the mouth of the bag, means for removing air from the bag while the mouth thereof is still open and means for pressing together opposed walls of the mouth of the bag so as to temporarily close the same while transporting the bag from the air removing means to the sealing means.

The bag sealing means may be of any type well known to the art such, as for example, a pressure sealing means for a cold seal, a gluing and pressing means where adhesive is applied to the mouth of the bag before closing, or a pressure and heat sealing means. For purposes of illustration the machine 10 shown in Figs. 1 through 6 includes a bag sealing means of the last type, such as is shown and described in detail in the aforesaid copending application.

Said bag sealing means includes two rolls 12, 14 having sealing portions 16, 18 whose peripheries are milled in matching registration to crimp and press together opposed walls of the mouth 20 of a bag 22. Said rolls are rotatably supported on vertical shafts 24 whose upper ends are fixed in a frame 26 fastened to bed plates 28, 30 disposed beneath the rolls 12, 14. The rolls have meshing gears 32 so that the rolls will turn in synchronism. One of the rolls also has a sprocket 34 and carries a bevel gear 36 which meshes with a second bevel gear 38 on a drive shaft 40 actuated from a suitable source of power (not shown).

The plates 28, 30 have two opposed longitudinal edges disposed in spaced relationship to define a slot 42 through which the mouths of the bags project while the bags pass through the machine. The plates are maintained in desired spaced relationship by C-clamps 43. The legs of said clamps may be sprung together by a knurled nut 44 and threaded rod 46 (Fig. 4) whereby the plates may be moved towards and away from each other. The rolls are so arranged that the sealing portions 16, 18 overlie said slot 42 and are thus properly positioned to seal the mouth of the bags.

The rolls may be maintained at an elevated temperature by resistance heating elements 47 whose operation is controlled by a manually operated switch (not shown).

If desired, the plates 28, 30 may support strip heaters 48 which lie in the same plane as the sealing portions 16, 18 and to both sides of the mouth of the bag as it passes through the machine. The operation of these heaters is likewise controlled by a manually operated switch (not shown) so that the mouth of the bag can be pre-heated before pressure is applied to the same.

A typical bag 22, such as is adapted to be sealed with the use of the sealing means just described, has the inner surfaces of its mouth coated with a layer 23 of a substance which at the temperature and pressure of sealing will cause the walls of the mouth to adhere. Said bag is shown

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as having contents in the form of an inner carton 50 (Fig. 2), the bag itself having been disposed in an outer carton 52.

The means for transporting the bags from the air removing means to the bag sealing means past the preheating strip heaters 48 includes two endless V-shaped belts 54, 56 (Figs. 1-5) each of which is driven by a large sheave 58, 60. The belt 54, after leaving the sheave 58, rides around a small diameter sheave 62 near the air removing means and then returns to the large sheave 58 along a reach paralleling and disposed above the portion of the slot 42 between said air removing means and said sealing means. A part of said reach is disposed beneath the pressure sealing portion 16. Said reach is maintained in position by a plurality of small diameter sheaves 64 rotatably supported on the bed plate 28, these sheaves being tangent to the reach. The other belt 56 is supported and travels in a similar manner. The bases of the two belts along said reaches face each other over the slot 42. The spacing between the belts can be varied by springing together the legs of the C-clamps 43. Said belts should be so adjusted that they will firmly press between them the opposed faces of a bag mouth. It will be noted that the closely spaced sheaves 64 by backing up the belts enable such pressure to be maintained over the entire lengths of said reaches.

The air removing means in this embodiment of my invention comprises an air evacuating mechanism 66 (Figs. 1, 2 and 3) which sucks the residual air from the space between the bag 22 and the inner carton 50 as well as the air in the bag above said carton. Said evacuating mechanism 66 includes a flexible conduit 68 connected to a source of sub-atmospheric pressure as, for example, the suction outlet of an air pump 70. This conduit leads to a suction nozzle 72 which is adapted to be placed in the mouth 20 of a bag 22 as the same is being drawn between the two belts 54, 56 near the air evacuating mechanism 66. Said nozzle is kept in the bag until either the mouth of the bag lies completely between the two belts or there is insufficient room for the nozzle. It will be observed that in the latter case the travel of the bag is sufficiently rapid and the bag mouth closed nearly enough to prevent any appreciable amount of air from reentering the bag until the mouth of the bag lies wholly between said belts. Once the entire mouth of the bag is clamped between the two belts, they will exert sufficient pressure to prevent any air from reentering the space just evacuated between the bag and the inner carton 50 during the preheating and until such time as the bag is sealed.

Although the suction nozzle 72 may be manipulated by hand in the manner aforesaid with a high degree of efficiency, the same may be also operated by automatic means. Such means may comprise a slotted plate 74 in which a hollow pneumatic fitting 76 is slidably mounted for movement towards and away from a stop 77 in a direction parallel to the slot 42. A shoulder 76a on the fitting rides on the lower edge of the plate 74 to prevent said fitting from turning in the slot. The fitting is biased to a position remote from the entrance end of the machine by a light spring 78. The conduit 68 is connected to one end of said fitting 76 and the other end is angled down to run into a tube 80 in which is telescopically received a pipe 82 on whose lower end the nozzle 72 is formed. The connection between the pipe and tube is rendered substantially

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air-tight by means of a stuffing box, packing or the like.

A compression spring 84 housed in a telescopic casing 86 biases the pipe 82 downwardly toward a position in which said nozzle extends into the mouth of an underlying bag. The pipe is moved in the opposite direction by a solenoid 88 mounted on the tube 80 and connected to said pipe by a rigid angle bar 90.

It will now be seen that in order to lower the nozzle, it is merely necessary to interrupt the energizing circuit for the solenoid whereupon the spring 84 will force the nozzle downwardly into the underlying mouth of a bag. The light spring 78 will allow the nozzle to move with the bag as the same is drawn between the belts 54, 56.

The solenoid should be energized as the bag approaches a position in which the mouth thereof lies almost fully between said belts and said solenoid should remain energized as the spring 78 retracts the nozzle 72 and fitting 76. To accomplish this operation automatically, means is provided responsive to the position of a bag at the evacuating mechanism for connecting and disconnecting the solenoid in an electric energizing circuit. Said means comprises a radiant-energy-emitting element such as an electric light bulb 92 whose beam is directed at a radiation sensitive device such as a photo-electric cell 94. Said cell is connected to a battery 96 and one terminal of the solenoid 88 through an amplifier 98, the other battery terminal being connected to the other terminal of the solenoid through said amplifier.

The beam transects the path traversed by the bags 22 at a point such that when crossed by the trailing edge of the bag the nozzle 72 should be lifted. It will be apparent that the leading edge of the next bag, which is spaced from the trailing edge of the preceding bag, at the time it crosses such point, will cut off energization of the photo-electric cell and de-energize the solenoid, while its mouth is in proper position to receive the suction nozzle 72.

In Fig. 2 the bag 22 depicted in full lines is in a position wherein its leading edge intercepts the beam of light and causes the discharge nozzle to enter the bag. The bag illustrated in dot-and-dash lines is in a position wherein its trailing edge clears the beam to permit the nozzle to be raised. It may be mentioned that since the bag 22 may be in an outer carton 52 the terms "leading edge" and "trailing edge" of the bag will also be understood to connote the leading and trailing edges of such carton.

If the weight of the goods packed in the bag is too great to be conveniently supported between the belts 54, 56, I may dispose beneath the slot 42 a conventional anti-friction support 100 including a plurality of parallel rotating roller pins 102. Said support may also act as a gauge to properly position the bag in such manner that its mouth extends a predetermined distance above the top of the preheating strips 48, as more fully described in the aforesaid copending application.

It may be desirable to keep the mouths of the bags closed by external means until such time as the seal is set and at the same time to move the bag to the discharge end of the machine. To this end I provide a conveying and cooling means which holds the opposed walls of the mouth of the bag together until the seal is set while conveying the bags to a discharge point. Said conveying and cooling means (Figs. 1 and 2, and

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particularly Fig. 6) comprises another pair of endless V-shaped belts 104, 106. Each of these belts travels around a large sheave 108, 110 near the sealing means and small sheave 112 at the discharge end of the machine, said sheaves being so disposed that a reach of each belt lies over a portion of the longitudinal slot 42. The facing surfaces of the belt along these reaches are flat and so relatively disposed as to engage and firmly press between them the opposed faces of the sealed bag mouth. Closely spaced supporting and guiding sheaves 114 similar to the sheaves 64 maintain these reaches of the belts 104, 106 in proper position. Adjustment of a C-clamp 115 in this region of the machine will vary the pressure applied by said belts to the sealed bag mouth. The sheaves 60, 110 are both carried by a shaft 116 on which there is fixed a sprocket 118 connected to the sprocket 34 by a chain 120 which thus drives the belts 56, 106. The belts 54, 104 are driven by frictional contact from the belts 56, 106. The sheaves 58, 108 are also fixed to a single shaft 122.

It will be noted that the belts 54, 56 operate in a plane below the preheating strip heaters 48 to facilitate construction and operation of the machine and to enable heating of the sealing film 23 on the interior of the bag without heating of said belts. However, the said belts 104, 106 operate in the same plane as the strip heaters to hold the cohering portions of said sealing film against each other until the seal is set.

In Figs. 9 through 11, I have shown a modified form of my invention employing a different construction and operation of the air removing means. In this modification, the air removing means instead of extracting air by suction removes air from the bag by displacement with another gas which will force the air out of the bag. I accomplish this by employing an air displacing mechanism 130 which blows an inert gas, such as carbon dioxide, into the bag before the bag is closed. Said air displacing mechanism 130 includes a pump 132 whose intake line 134 is connected to a supply of carbon dioxide. The pumps outlet 136 is coupled to a resilient pipe 138 made, for example, of rubber, which is fixed to a short tube 140 journaled in a bearing 142 mounted on the plate 30. The opposite end of the tube 140 is secured to an elbow fitting 144 which is free to swing about the tube 140 as a center. The elbow fitting is connected to a conduit 146 in which a pipe 148 is slidably mounted for axial movement. The end of said pipe terminates in a nozzle 150. A compression spring 152 housed in a telescopic casing 154 biases said pipe 148 downwardly towards a position in which it is adapted to extend into the open mouth of an underlying bag. The pipe is moved in an opposite direction by a solenoid 156 connected thereto by an angle bar 158. The overall length of the conduit and pipe in fully extended position is such that the nozzle 150, pivoting about the tube 140, will remain in the bag as the bag is drawn in between the belts 54, 56 until just before the mouth of the bag 22 is closed by said belts. This latter position is shown by the dot-and-dash lines in Fig. 10. As the bag passes this position the trailing edge thereof will clear the tip of the nozzle and permit the same to swing back to vertical.

It will be appreciated that the nozzle must be in extended position when it is disposed within the mouth of the bag and in retracted position after it is swung back so as to be ready to enter

the mouth of another bag. Extension of the nozzle is effected by interrupting an energizing circuit for the solenoid 156 thus allowing the spring 152 to force the nozzle 150 downwardly into the underlying mouth of a bag. After the tip of the nozzle clears the trailing edge of a bag, the solenoid is reenergized so as to draw the pipe 148 into the conduit 146 and allow the tip of the nozzle to clear the mouth of the next bag (dash-double dot-lines in Fig. 10). This operation is accomplished automatically by a mechanical means which is actuated by the bag in certain positions and which controls the energizing circuit for the solenoid.

Said means comprises a long feeler arm 160 carrying a switch contact 162 adapted to cooperate with a switch contact 164 in the circuit which energizes the solenoid from a source of electric power. The tip of said feeler lies in such position that when a bag is disposed beneath the air displacing means, ready to receive the nozzle 150, said bag will push the feeler to one side and open the contacts 162, 164 to de-energize the solenoid. When this occurs the spring 152 will force the tip of the nozzle into the bag. At the same time leads 166, 168 connected across the lead in wires to the solenoid 156 de-energize a relay 170 to cause power to be supplied to a motor M which actuates the carbon dioxide pump 132. Thus movement of the feeler 160 causes the nozzle to be inserted in the bag and starts the flow of carbon dioxide through the nozzle.

In Figs. 9 through 11 the bag 22' is illustrated as being of a type in which coffee is packed and the feeler 160 is so disposed that when the bag is situated beneath the air displacing means the leading edge of the bag will not touch the belts 54, 56 and so be drawn into the machine 10 although it will push the feeler aside. This enables the nozzle to be given sufficient time to flow enough carbon dioxide into the bag to displace substantially all the air contained therein. The period over which the bag is allowed to remain stationary is determined by the operator. After such period has elapsed, the bag is moved forward by the operator until its leading edge is introduced between the belts 54, 56 whereupon said bag will be pulled into the machine. The nozzle remains in the bag and continues to pump in carbon dioxide until the bag mouth is substantially closed by said belts.

It may be desirable to introduce a product, for example coffee, into the bag while it remains stationary and after a sufficient amount of carbon dioxide has been introduced. For this purpose, I provide a filling spout 172 through which coffee can discharge. A valve 174 having a manually operable handle 176 controls the flow of the coffee. Under a typical procedure, the coffee is discharged into the bag after the bag is filled with carbon dioxide and while the carbon dioxide is still flowing and said valve is closed before the leading edge of the bag is introduced between the belts 54, 56.

It may also be desirable to provide a support in the form of a steel plate 178 beneath the air displacing and coffee loading station to take up part of the impact force of the coffee descending into the bag. It will be appreciated that this plate can function as a physical abutment gauge for placing the mouth of the bag in proper position relative to the preheating strips as is more fully explained in the said copending application.

It will thus be seen that I have provided an apparatus in which the several objects of this

invention are achieved, and which is well adapted to meet all conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A machine of the character described for sealing the open mouth of a bag, said machine comprising means for sealing the bag, means spaced from said sealing means for removing air from the bag, and a pair of endless belts having parallel reaches opposed to each other and extending between said air removing means and said bag sealing means, means for urging said reaches together to compress between them the mouth of the bag being transferred, means to move said belts whereby said belts transfer said bag from said air removing means to said bag sealing means after the air has been removed therefrom while holding the mouth of the bag closed during such transfer so as to prevent reentry of the air before sealing of the bag.

2. A machine as set forth in claim 1 wherein means is provided to adjust the pressure with which the parallel reaches of the belts compress the opposite walls of the mouth of the bag.

3. A machine of the character described for sealing the open mouth of a flexible bag having a thermoplastic material at the sealing zone, said machine comprising rotary means to progressively apply heat and pressure to said thermoplastic layer across the mouth of the bag and thus progressively seal the mouth of the bag, means to remove the air in said bag prior to the sealing thereof, and means to transfer said bag from said air removing means to said rotary sealing means and to compress together the opposite walls of the mouth of said bag throughout such transfer so as to prevent reentry of air before sealing of the bag, said transferring means including a pair of endless belts having parallel reaches opposed to each other and extending between said air removing means and said rotary sealing means, means to press said reaches together so as to compress between them the opposite walls of the mouth of the bag, and means to move said belts.

4. A machine as set forth in claim 3 wherein the parallel reaches of the endless belts extend through and beyond said rotary sealing means so as to compress between them the opposite walls of the mouth of said bag after sealing and during setting and prevent reentry of air during setting.

5. A machine as set forth in claim 3 wherein the parallel reaches of the endless belts extend through and beyond said rotary sealing means so as to compress between them the opposite walls of the mouth of said bag after sealing and during setting and prevent reentry of air during setting, and wherein means further is provided to compress the opposite walls of the mouth of the bag at the zone where the same has been sealed, said last named means including another pair of endless belts having parallel reaches opposed to each other and extending away from said rotary sealing means, said belts being provided with means to force the last named parallel reaches toward each other and compress between them the portions of the opposite walls of the mouth of the bag already sealed.

6. A machine of the character described for

sealing the open mouth of a bag, said machine comprising means for sealing said bag, means spaced from said sealing means for progressively removing air from said bag, means for transferring said bag from said air removing means to said sealing means and for closing the mouth of the bag and keeping same closed during such transfer, said air removing means continuing to function until the mouth of the bag is closed by said transferring means, and electric switch controlled means for rendering said air removing means effective when the bag is positioned therebeneath and for rendering the air removing means ineffective when the mouth of the bag is substantially closed.

7. A machine of the character described for sealing the open mouth of a bag, said machine comprising means for sealing said bag, means spaced from said sealing means for progressively removing air from said bag, means for transferring said bag from said air removing means to said sealing means and for closing the mouth of the bag and keeping same closed during such transfer, said air removing means continuing to function until the mouth of the bag is closed by said transferring means, and radiant beam controlled electric switch means for rendering said air removing means effective when the bag is positioned therebeneath and for rendering the air removing means ineffective when the mouth of the bag is substantially closed.

8. A machine of the character described for sealing the open mouth of a bag, said machine comprising means for sealing said bag, means spaced from said sealing means for progressively removing air from said bag, means for transferring said bag from said air removing means to said sealing means and for closing the mouth of the bag and keeping same closed during such transfer, said air removing means continuing to function until the mouth of the bag is closed by said transferring means, and feeler controlled means for rendering said air removing means effective when the bag is positioned therebeneath and for rendering the air removing means ineffective when the mouth of the bag is substantially closed.

9. A machine of the character described for

sealing the open mouth of a bag, said machine comprising means for sealing said bag, means spaced from said sealing means for progressively removing air from said bag, means for transferring said bag from said air removing means to said sealing means and for closing the mouth of the bag and keeping same closed during such transfer, said air removing means continuing to function until the mouth of the bag is closed by said transferring means, said air removing means including a conduit which is mounted to move with the bag, and means to lift said conduit out of the bag just as the mouth of the bag is fully closed by the transferring means.

10. A machine of the character described for sealing the open mouth of a bag, said machine comprising means for sealing said bag, means spaced from said sealing means for progressively removing air from said bag, means for transferring said bag from said air removing means to said sealing means and for closing the mouth of the bag and keeping same closed during such transfer, said air removing means continuing to function until the mouth of the bag is closed by said transferring means, said air removing means including a pair of telescoping conduits, means to retract said conduits into nested relationship when no bag is disposed therebeneath, and means to extend said conduits when a bag is disposed therebeneath.

11. A machine of the character described for sealing the open mouth of a bag, said machine comprising means for sealing said bag, means spaced from said sealing means for progressively removing air from said bag, and means for transferring said bag from said air removing means to said sealing means and for closing the mouth of the bag and keeping same closed during such transfer, said air removing means continuing to function until the mouth of the bag is closed by said transferring means, said air removing means including a swingably mounted conduit having a nozzle adapted to be disposed in the bag during removal of air and to clear the bag as the bag is moved to a point where its mouth is substantially closed.

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