

- [54] MACHINE FOR CLOSING FILLED BAGS
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 [51] Int. Cl. B65h 13/16
 [58] Field of Search 53/135, 138 A, 198, 53/198 A, 198 B; 156/484, 485, 521

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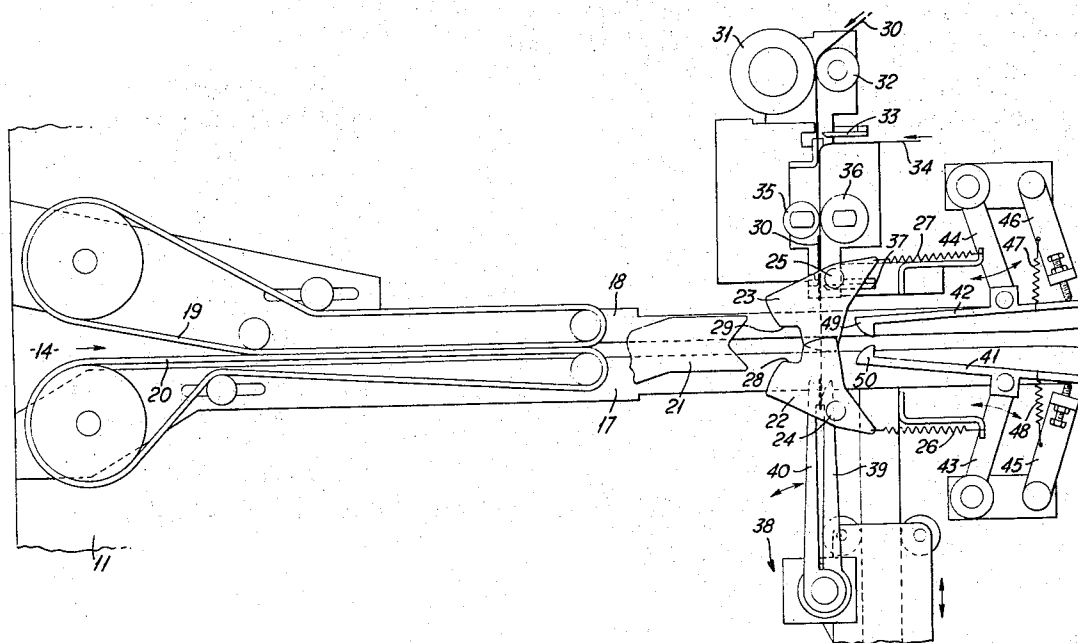
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[57] ABSTRACT

A machine for closing the open ends of filled bags

which are conveyed through the machine by a conveyor comprises a guide for receiving the open end part of each filled bag as it is moved through the machine, a stop which is movable between a retracted position and an advanced position in which it extends into the path of the end part of the bag as this moves along the guide, a follow-up member which is moved along the guide following the bag to compress the open end part of the bag against the stop which then moves towards the retracted position as the compressed end of the bag is moved further along the guide, means for supplying a length of adhesive strip and holding it across the path of the compressed part of the bag as this moves further along the guide and means for clamping the adhesive strip around the compressed end part of the bag to close the bag, the clamping means subsequently releasing the closed end of the bag to allow it to be moved by the conveyor out of the guide. Preferably the stop comprises a pair of contra-rotatable members which are pivotable between the advanced and retracted positions and these members are biased by a spring into the advanced position and are moved to the retracted position by the pressure against them of the compressed end of the bag.

8 Claims, 6 Drawing Figures



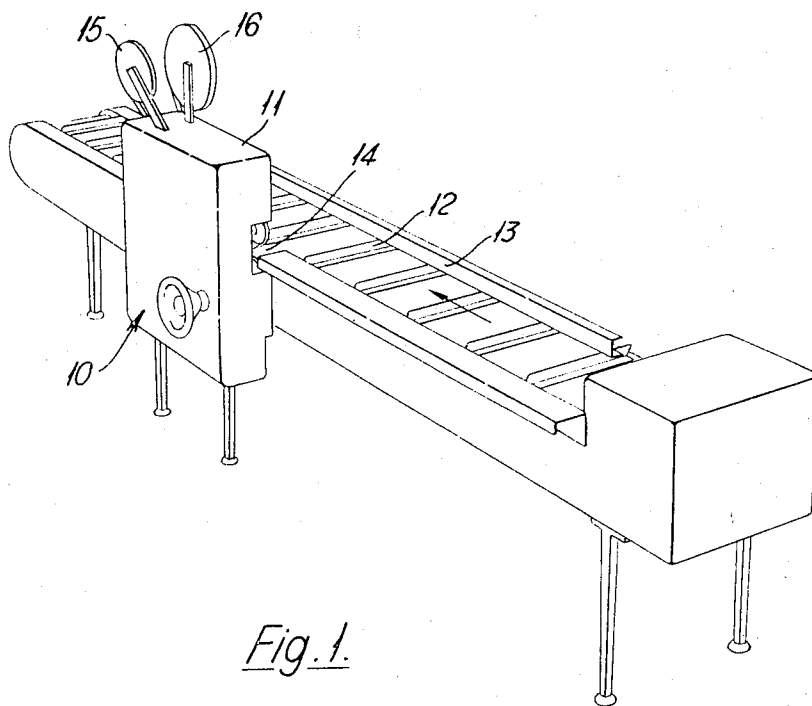
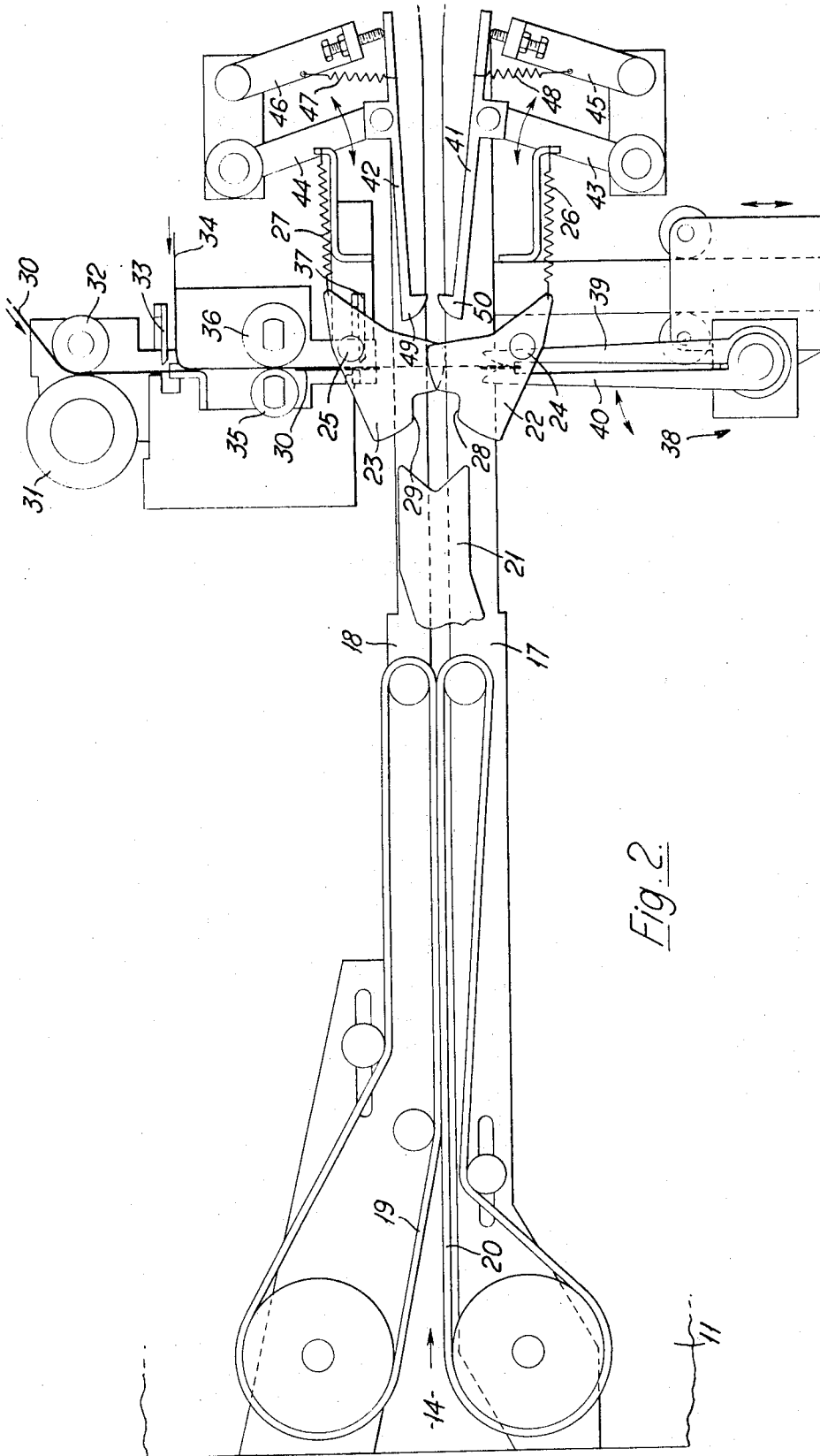


Fig. 1.

SHEET 2 OF 4



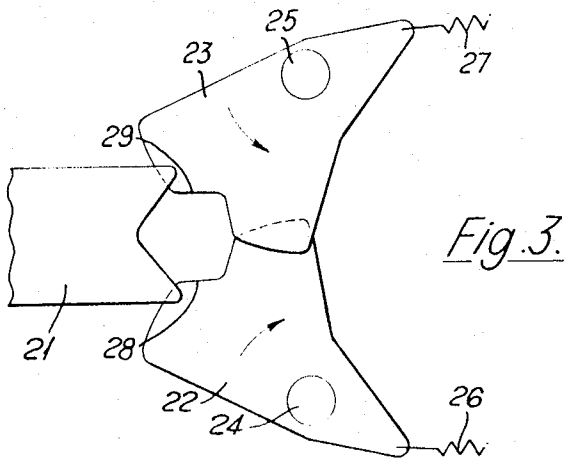


Fig. 4.

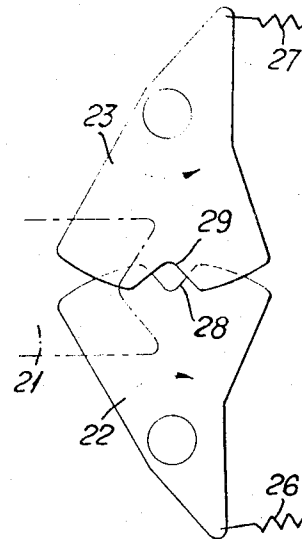
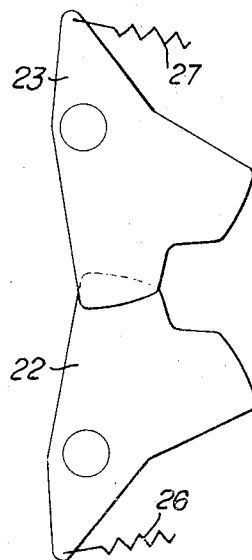


Fig. 5.



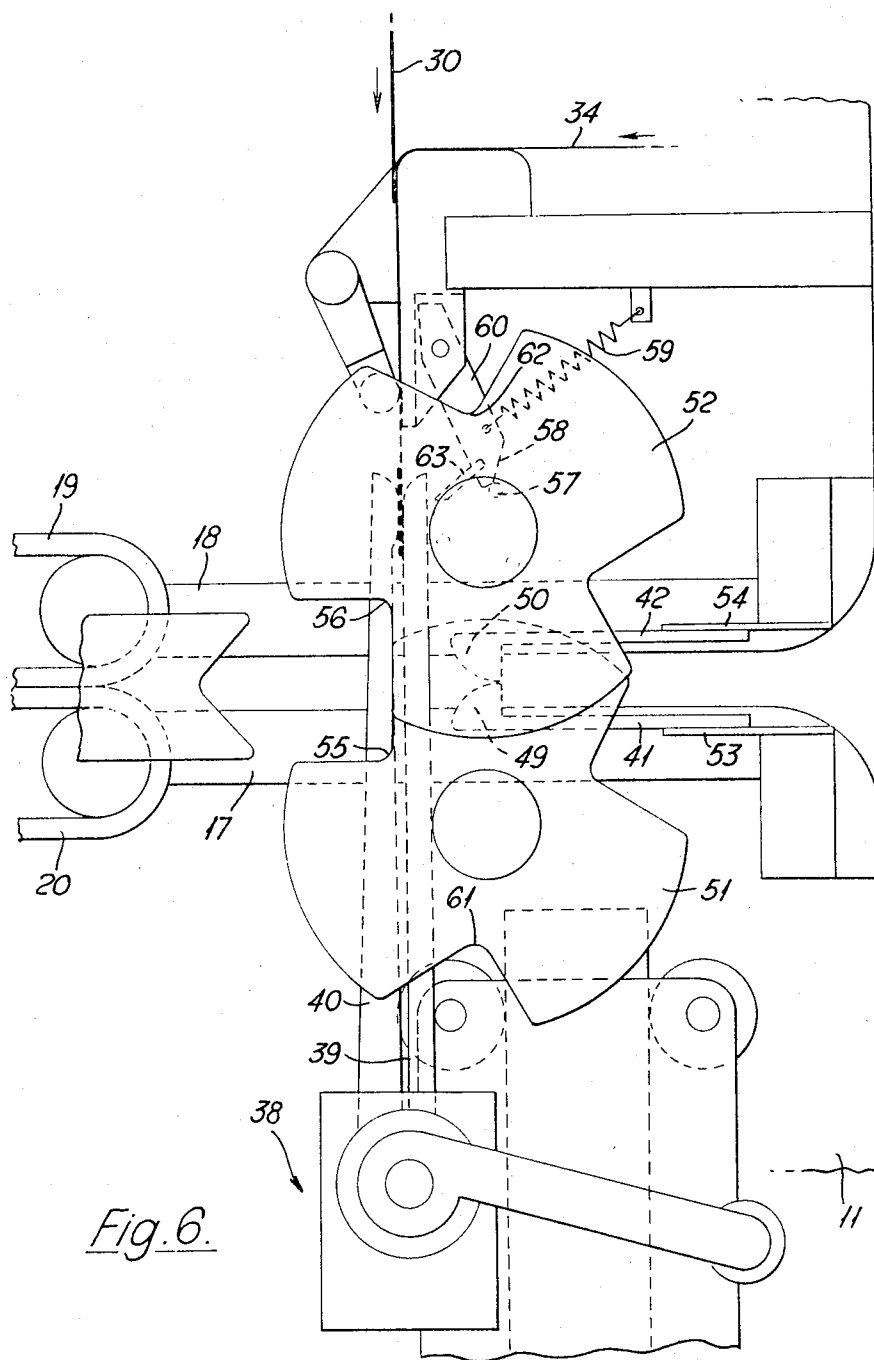


Fig. 6.

MACHINE FOR CLOSING FILLED BAGS

When bags, which may be made, for example, of polyethylene or other thin thermoplastic sheet material, are used for packaging goods such as food stuffs, it has been usual to close the bags by compressing the material of the open end of the bag together into a bundle and then securing it by means of adhesive strip extending around the bundle and holding it together.

The operations of compressing the material at the open end of the bag together and subsequently securing it with adhesive strip have been carried out manually and consequently at considerable expense owing to the high labour costs involved. The aim of the present invention is to provide a machine which will perform these operations automatically.

According to this invention, such a machine comprises a guide which, in use, receives the open end part of a filled bag as it is moved through the machine, a stop which is movable between a retracted position and an advanced position in which it extends into the path of the end part of the bag as this moves along the guide, a follow-up member which is movable along the guide following a bag to compress the end part of the bag against the stop with the stop in its advanced position, the stop then moving to its retracted position as the compressed end part of the bag is moved further along the guide, means for supplying a length of adhesive strip and holding it across the path of the compressed end part of the bag as this moves further along the guide, and means for clamping the length of adhesive strip around the compressed end part of the bag to hold the bag closed, the clamping means subsequently releasing the closed end part of the bag to allow it to be moved out of the guide. It is possible for the bags to be moved manually one after another through the machine with their open end parts passing through the guide, but preferably the machine is used in conjunction with a conveyor which conveys the bags successively through the machine with their open end parts extending towards one edge of the conveyor so that the open end parts move one after another through the guide. In this way, all that is necessary is for the open bags with their contents to be fed onto the conveyor in the required position and the operation of closing their open ends is then performed during the bags' passage and without it being necessary to remove them from the conveyor or halt the movement of the conveyor in any way. A movement of the open end parts of the bags themselves may halt momentarily as these parts of the bag are compressed against the stop and as the compressed bundle is held by the clamping means, but the length of time involved if this happens will be only a fraction of a second so that all that happens is the bag turns slightly on the conveyor, and then continues on its passage. The machine may be mounted above a conveyor belt so that bags filled with loose commodities, for example, potatoes or Brusselssprouts, may also be closed. In this case the filled bags are stood upright on the conveyor so that their open end parts are uppermost.

Preferably the stop is mounted so that it can pivot between its advanced and retracted positions, the stop being biased into its advanced position and being moved by the compressed end of the bag into its retracted position, and the clamping means being arranged to clamp the length of adhesive strip around the

compressed end of the bag during this movement. The stop may then be in the form of a pair of contrarotatable members, the members having cooperating faces which, when the members are rotated from the advanced position towards the retracted position surround the compressed end part of the bag to hold it compressed until the adhesive strip is clamped around it.

The preferred example of a machine according to our invention also includes a holder for a continuous roll of adhesive strip, means for supplying the adhesive strip from the roll and a cutter for severing lengths of adhesive strip from the roll, the supplying means comprising a gripper which reciprocates back and forth across the guide and a pair of feed rolls for the adhesive strip, the gripper being arranged to grip the free end of the strip and draw a length of the strip from the roll across the path of the compressed end part of the bag, this length of strip being held in position between the gripper and the feed rolls, and the cutter being arranged to sever this length of strip from the roll when the compressed end part of the bag has come into contact with the strip.

Preferably a device is also provided for applying spaced lengths of non-adhesive strip at intervals to the adhesive strip on its passage from the roll to the gripper. The gripper then grips the end of the adhesive strip to which a section of non-adhesive strip has been applied and subsequently the adhesive strip is severed through part of the adhesive strip to which the next length of non-adhesive strip has been applied. Thus both ends of the length of the adhesive strip which are clamped around the compressed part of the bag have non-adhesive strip covering them so that they form tabs which can later be gripped with the fingers to enable the adhesive strip to be removed to open the bag. Further, because the adhesive strip is severed through a part which has been covered with non-adhesive strip, the severed end of the adhesive strip already has the non-adhesive strip applied to it ready to be held by the gripper in the next cycle of operation.

The open end parts of the bag may be drawn into the guide by two movable belts forming a divergent entry to the guide. These belts may also move the end parts of the bags along the guides until the follow-up member takes over.

An example of a machine and of a modification of the machine in accordance with our invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a diagrammatic perspective view of the machine mounted alongside a conveyor for carrying filled bags;

FIG. 2 is a somewhat diagrammatic longitudinal section through the machine;

FIGS. 3, 4 and 5 are a series of detail views of a stop forming part of the machine shown in FIG. 2 and its sequence of movement; and,

FIG. 6 is a somewhat diagrammatic sectional view of a modification of the machine.

FIG. 1 shows a bag typing machine 10 enclosed by a casing 11 and mounted at one side of an endless conveyor belt 12. A fixed kerb 13, which is mounted along the opposite side of the conveyor belt 12, is arranged to position a series of filled bags laying horizontally on the belt 12 so that open end parts of the bags successively enter an aperture 14 in the casing 11. Mounted

on the casing 11 are a holder 15 for a roll of adhesive strip and a holder 16 for a roll of paper strip.

As shown in FIG. 2 the machine has a pair of guide bars 17 and 18 which together form a guide and diverge from each other in a direction towards the aperture 14 in the casing 11. In the opposite direction, that is the direction in which the bags move through the machine, the guide bars 17 and 18 run parallel to each other their axes being parallel to the conveyor 12. A pair of endless conveyor belts 19 and 20 are driven so that their adjacent surfaces move in the same direction as that of the bags through the machine and ensure that the open ends of the bags move into position between the guide bars 17 and 18. A follow-up member 21 is reciprocated and moves forwards along the path of the ends of the bags as they travel between the guide bars 17 and 18 and then returns. During part of its return stroke the member 21 is displaced downwards out of the path of the bags. A stop is formed by two contra-rotatable blades 22 and 23 which are capable of pivoting about axes 24 and 25 and are biased into an advanced position, as shown in FIGS. 2 and 3, by springs 26 and 27. The blades 22 and 23 have indents 28 and 29 on their faces against which the open end parts of the bag are compressed by the follow-up member 21.

Paper strip 30 from a roll held on the holder 16 is passed through the nip of a feed rolls 31 and 32. A knife 33 is arranged to sever the strip 30 at intervals. Adhesive strip 34 from the roll held on the holder 15 follows a stationary guide so that its adhesive side moves into contact with the paper strip 30. The adhesive strip 34 with spaced lengths of paper strip 30 applied to it passes through the nip of guide rolls 35 and 36. A knife 37 is arranged to sever at intervals both the adhesive strip 34 and the length of paper strip 30 that has been applied to it. A gripper 38 comprises an arm 39 and a second arm 40 pivoted to the first arm 39 so that it can move away from and towards it to grip the joined strips 30 and 34. The gripper 38 reciprocates back and forth across the path of the bags to grip the joined strips 30 and 34 and then pull them across the path of the bags.

A pair of clamping arms 41 and 42 are pivotally attached to rotatable links 43 and 44. Further links 45 and 46 with which the arms 41 and 42 are held in engagement by springs 47 and 48, form a parallel motion system so that the arms can be reciprocated back and forth along the axis of the guide formed by the bars 17 and 18. The arms 41 and 42 have curved jaws 49 and 50 at their upstream ends in the direction of movement of the bags, which in use clamp the adhesive strip 34 around the compressed end parts of the bags.

In operation, bags which have been filled either by hand or by an automatic filling machine are fed onto the conveyor 12 so that their open ends face towards the bag tying machine 10. A kerf 13 is adjusted for the particular size of bag so that their open ends successively enter the aperture 14 and the casing 11 of the machine. The open neck of each bag in turn is then engaged and guided by the moving belts 19 and 20 into the gap between the stationary guide bars 17 and 18. The speed of the belts 19 and 20 is adjusted to be substantially the same as that of the conveyor belt 12. Whilst the bag is between the guide bars 17 and 18 the follow-up member 21 moves along the axis of the guides 17 and 18 behind the bag at a speed greater than

that of the conveyor belt 12 and engages with the rear end of the bag.

The gripper 38 moves upwards towards the adhesive strip feed rolls 35 and 36 with its arms 39 and 40 apart. At the limit of the upward movement of the gripper 38, the arms 39 and 40 close to grip the paper covered end of the adhesive strip 34. The gripper 38 then moves downwards and pulls the strip 34 with the lengths of paper strip 30 on it through the pair of rollers 35 and 36. These bring the adhesive strip 34 and the following portion of paper strip 30 into close contact so that the paper strip 30 firmly adheres to the adhesive strip 34. The feed rolls 31 and 32 are powered and so govern the moment at which the paper strip 30 and the adhesive strip 34 come into contact and the knife 33 governs the length of the strip of paper that is applied. When the gripper 38 has moved into its lowermost position an uncovered portion of the adhesive tape 34 lies across the path of the bag along the guide bars 17 and 18.

As the end part of the bag is moved further along in between the guide bars 17 and 18 its forward end engages the edges of the indents 28 and 29 on the blades 22 and 23. The follow-up member 21 continues to move in the direction parallel to the axis of the guide bars 17 and 18 and eventually compresses the neck of the bag between itself and the edges of the indents 28 and 29. This position is shown in FIG. 3. As the motion of the follow-up member 21 is continued the blades 22 and 23 pivot against the action of the springs 26 and 27 about their axes 24 and 25 to take up a position shown in FIG. 4. The arc parts of the blades 22 and 23 in which indents 28 and 29 are formed now surround the compressed end part of the bag and the adhesive strip 34 is in contact with one side of the compressed end of the bag. The end of the bag is now held in this position as the links 43 and 44 are turned, moving the arms 41 and 42 along the axes of the guide bars 17 and 18 towards the compressed end of the bag. The curved jaws 49 and 50 on the clamping arms 41 and 42 come into contact with the non-adhesive side of the adhesive strip 34. At this point the knife 37 severs the adhesive strip 34 in the middle of the applied paper strip 30. By cutting both the paper strip 30 and the adhesive strip 34 together in the middle of the applied paper strip 30, tabs are formed on both the trailing end of the severed lengths of adhesive strip and the leading edge of the adhesive strip that is still attached to the roll. This leading edge will subsequently form the strip for the following bag. A further length of paper strip 30 will subsequently be applied to the adhesive strip 34 and once again both strips will be severed in the middle of the applied paper strip. In this way each severed length of adhesive strip used for wrapping around the compressed end of a bag has a non-adhesive paper tab at each of its ends. These may subsequently be gripped by the fingers of the user to open the bag.

The arms 39 and 40 of the gripper 38 move apart releasing the bottom of the adhesive strip, as the clamping arms 41 and 42 continue in their movement towards the left as seen in FIG. 2. Because of the shape of the jaws 49 and 50 the arms 41 and 42 move apart against the action of the springs 47 and 48 as the jaws 49 and 50 move around the adhesive strip 34 and clamp it against the compressed end part of the bag. As the arms 41 and 42 move further to the left, the jaws 49 and 50 complete their movement around the adhesive strip 34 now surrounding the compressed end of

the bag, so causing the end parts of the adhesive strip adjacent the paper tabs to stick to each other. The arms 41 and 42 are then retracted and engage the rear of the compressed end part of the bag and pull this further along the guide towards the right. The blades 22 and 23 pivot further against their bias springs 26 and 27 and so allow the compressed end part of the bag to escape when they reach the retracted position as shown in FIG. 5. The blades 21 and 22 then spring back to their advanced position as shown in FIG. 3 ready to engage the next bag.

The follow-up member 21 returns out of the path of the bag until it is behind the rearward end of the next bag and then it repeats the cycle. The tied up compressed end of the bag is moved further along the guide and out of the machine by the conveyor belt 12 moving the body of the bag and its contents. The machine is then ready to accept another filled bag and the cycle is repeated. As the compressed end of the bag is held briefly for the adhesive strip 34 to be clamped around it, the bags may slew slightly on the conveyor belt 12.

In the modification shown in FIG. 6, the blades 22 and 23 are replaced by star-wheels 51 and 52 and the clamping arms 41 and 42 are not pivoted but are instead attached to the guide bars 17 and 18 by leaf springs 53 and 54. The follow-up member 21 compresses the end of the bag against the edges of indents 55 and 56 in the star-wheels 51 and 52. The gripper 38 is in its lowermost position at this time but it is shown in the uppermost position in FIG. 6 to show the extent of its travel. After the follow-up member 21 has compressed the end of the bag against the edges of the indents 55 and 56, the continued pressure from the member 21 on the edges 55 and 56 causes the star-wheels 51 and 52 to rotate counter to each other. A pin 57 on the star-wheel 52 acting against a bearing surface 58 on a pivoted arm 60 moves the arm 60 against the action of the spring 59. This brings a knife 63 which is in this modification attached to the arm 60 into contact with the paper covered adhesive strip 34 so severing the adhesive strip in the middle of a length of paper 30. As the star-wheels 51 and 52 rotate the compressed end parts of the bag are surrounded by the parts of the wheels in which the indents 55 and 56 are formed and then, as the follow-up member 21 moves further towards the right as seen in FIG. 6 the compressed end of the bag is pushed between the jaws 49 and 50 of the sprung arms 41 and 42. These clamp the adhesive strip 34 around the end of the bag and eventually press the end parts of the adhesive strip 34 against each other so that it is held surrounding the compressed end part of the bag. The follow-up member 21 continues towards the right and the star-wheels 51 and 52 continue to rotate until the closed end part of the bag is released. A following pair of indents 61 and 62 are then in a position to receive the following bag. The follow-up member returns as before so that it is ready for the following bag. This modification has the advantage that the follow-up member 21 and hence the bag end moves continuously at a constant speed so that the bag does not slew on the conveyor 12. The arms 41 and 42 are only sprung instead of being powered and so are more simple in construction. A further advantage is that the knife 63 is operated directly in dependence upon the position of the end of the bag and so, will necessarily act at the correct time and only when the bag is in place.

Each end of the adhesive strip 34 surrounding the compressed end of the bag is covered by a non-adhesive paper tab so that by gripping these paper tabs the adhesive strip 34 may be easily parted from itself. This enables the user to undo the adhesive strip 34 surrounding the compressed end of the bag and so open the end of the bag. It also has the advantage that as the adhesive strip is not destroyed when it is removed it may be reused for resealing the bag. This is particularly beneficial since most resealable closures incorporate a metal strip, the presence of which is often undesirable.

The belts 19 and 20, the follow-up member 21, the feed rolls 31 and 32, the tape gripper 38, the knife 33 the knife 37 and in the first example the arms 41 and 42 are driven through a series of gears, cams and followers and links from either a single electric motor or a drive from, for example, the conveyor belt 12 or a bag filling machine. Because of this the timing of the operations of the various mechanisms remain correct once they have been set. The method of driving the various mechanisms by means of gears cams and followers and links is well known and may be readily accomplished by any arrangement of these that gives the correct sequence of events.

I claim:

1. A machine for closing the open ends of filled bags, said machine comprising guide means for receiving and guiding the open end part of said filled bag as said bag is moved through said machine, a stop, means mounting said stop adjacent said guide means for movement between a retracted position and an advanced position in which said stop extends into the path of said open end part of said bag as said open end part moves along said guide means, a follow-up member which is movable longitudinally of said guide means following said open end part of said bag to compress said open end part against said stop, said stop being moved from said advanced position to said retracted position as said compressed end part of said bag is moved further along said guide means, means for supplying a length of adhesive strip, means for holding said length of adhesive strip in a position extending across the path of said compressed end part of said bag as said compressed end part moves further along said guide means after engagement with said stop and means for clamping said length of adhesive strip around said compressed end part of said bag to close said bag, said clamping means being operable to subsequently release said end part of said bag to allow said end part to be moved out of said guide means.

2. A machine as claimed in claim 1, wherein said stop is carried by said mounting means for pivotal movement between said advanced position and said retracted position and further comprising means biasing said stop into said advanced position, said stop being movable by said compressed end of said bag from said advanced position to said retracted position and said clamping means being operable to clamp said length of adhesive strip around said compressed end of said bag during the movement by said compressed end of said stop from said advanced position to said retracted position.

3. A machine as claimed in claim 2, wherein said stop comprises a pair of contra-rotatable members, said member including means defining cooperating faces which are operable when said members rotate from said advanced position towards said retracted position

to surround said compressed end of said bag and to hold said compressed end compressed until said length of adhesive strip is clamped around said compressed end by said clamping means.

4. A machine as claimed in claim 3 wherein each of said contra-rotatable members comprises a star-shaped wheel including a series of indents around the periphery thereof, said indents including means defining edge faces which form said cooperating faces, and said biasing means being operative to align a pair of said indents one on each of said wheels in said advanced position, said compressed end part of said bag being subsequently released from said indents as said wheels are turned by said compressed end to bring said indents to said retracted position, and a further pair of said indents moving into said advanced position as said first mentioned pair of indents reach said retracted position.

5. A machine as claimed in claim 1, including means for supplying adhesive strip from a roll thereof, and cutter means for severing said length of adhesive strip from said roll thereof, said means for supplying said adhesive strip comprising a gripper reciprocable to and fro transversely of said guide means and a pair of feed rolls for said adhesive strip, said gripper being operable to grip a free end of said strip and draw said length of adhesive strip into a position transversely of said guide means across the path of said compressed end part of said bag, said length of adhesive strip being held in said

position between said gripper means and said feed rolls, and said cutter means being operative to sever said length of adhesive strip from said roll when said compressed end part of said bag has come into contact with said adhesive strip.

6. A machine as claimed in claim 5, further comprising means for feeding lengths of non-adhesive strip onto end parts of said length of adhesive strip on an adhesive face thereof.

7. A machine as claimed in claim 6, wherein said means for feeding lengths of non-adhesive strip includes means comprising a further pair of feed rolls for feeding said non-adhesive strip from a roll thereof and further cutter means, said further pair of feed rolls and said further cutter means being operative to supply and feed severed lengths of said non-adhesive strip spaced apart onto said adhesive face of said adhesive strip, said first mentioned cutter means being operable to sever both said adhesive strip and said severed lengths of non-adhesive strip simultaneously whereby each end of said length of adhesive strip has an end portion thereof covered with said non-adhesive strip.

8. A machine as claimed in claim 1, further comprising a pair of cooperating endless conveyor belts operable to move said open end part of said bag into said guide means.

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