March 29, 1960 M. S. COTTERELL 2,930,501

BAG OPENING AND EMPTYING MACHINE

Filed May 2, 1958 4 Sheets-Sheet 1

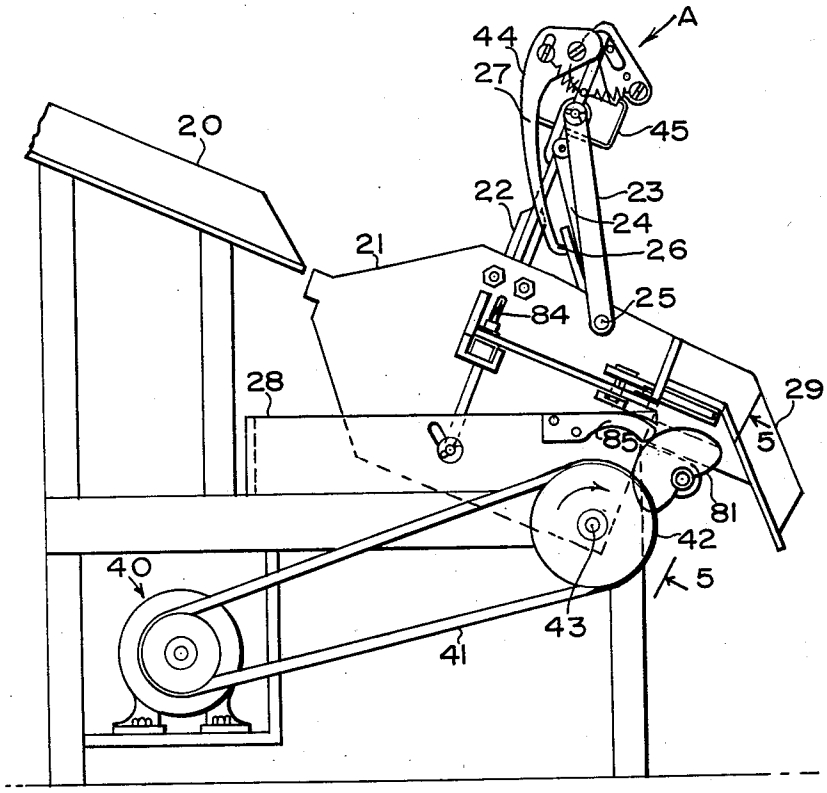



FIG.1.

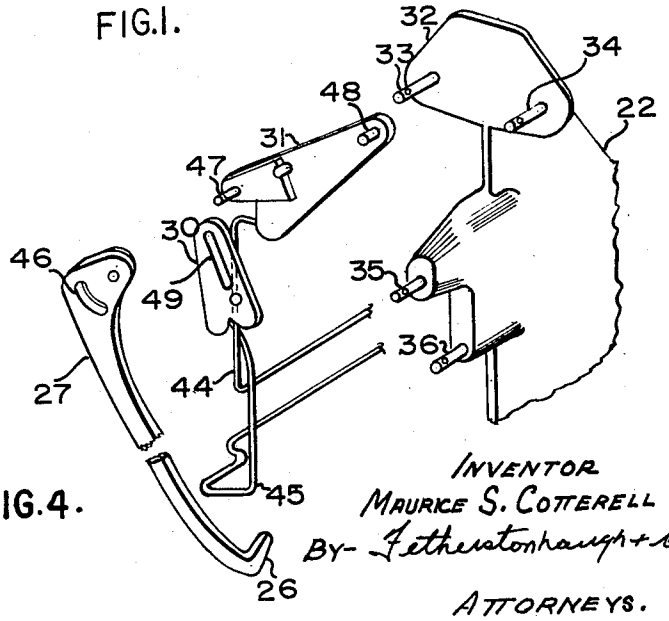



FIG.4.

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BAG OPENING AND EMPTYING MACHINE

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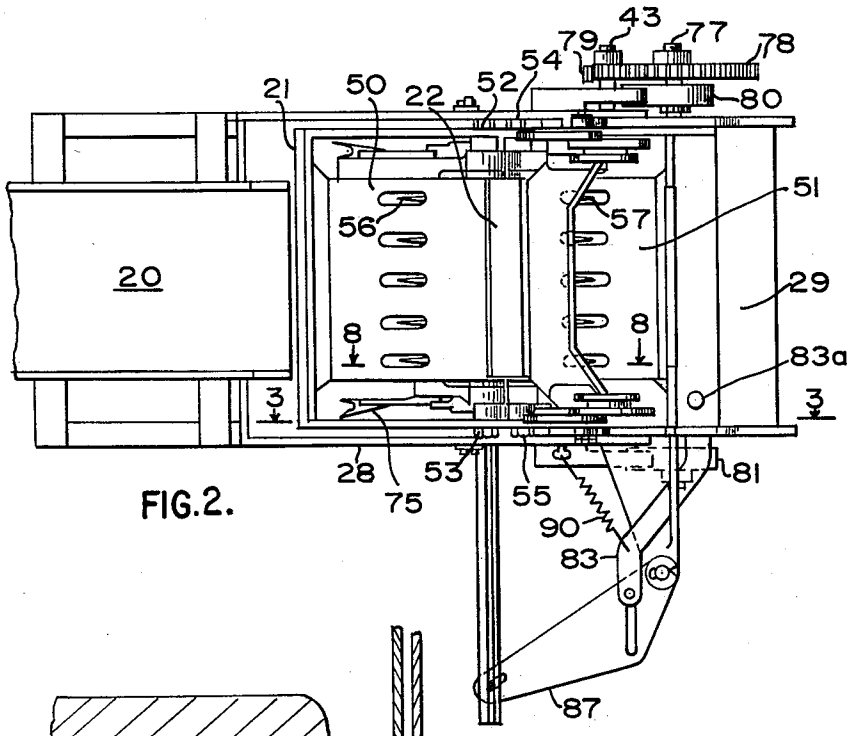



FIG.2.

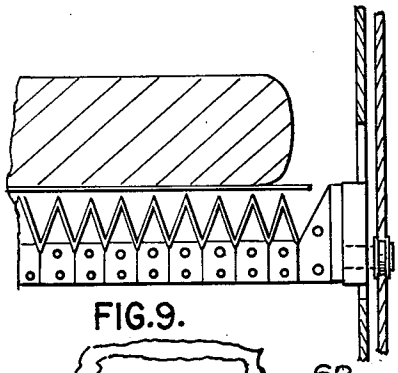


FIG.9.

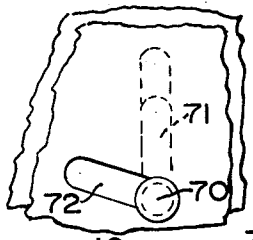



FIG.10.

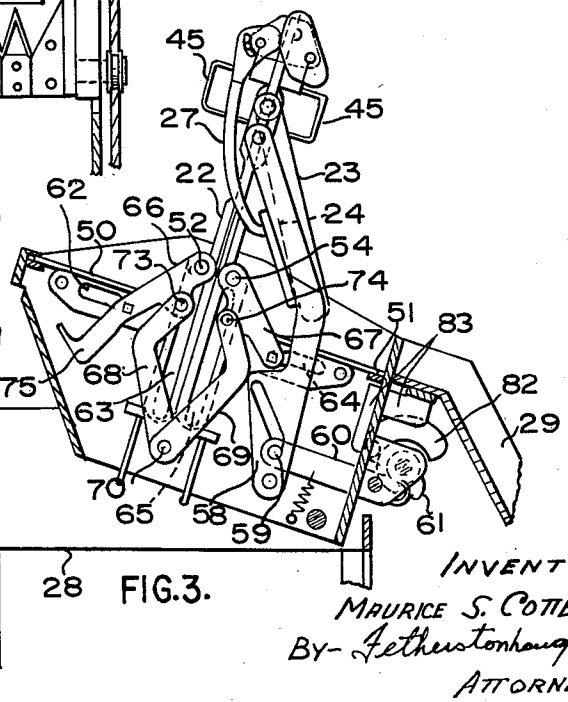



FIG.3.

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BAG OPENING AND EMPTYING MACHINE

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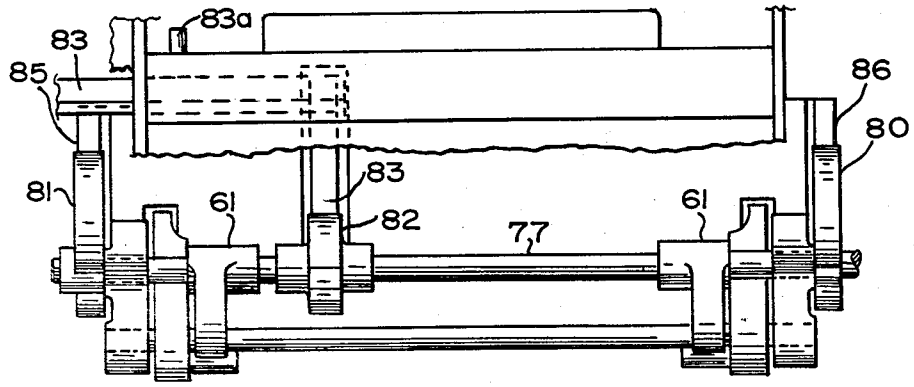



FIG. 5.

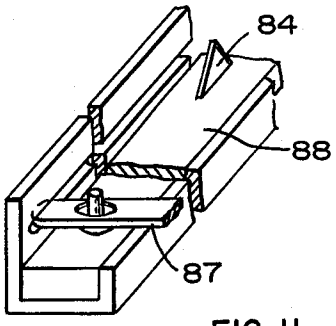



FIG. 11

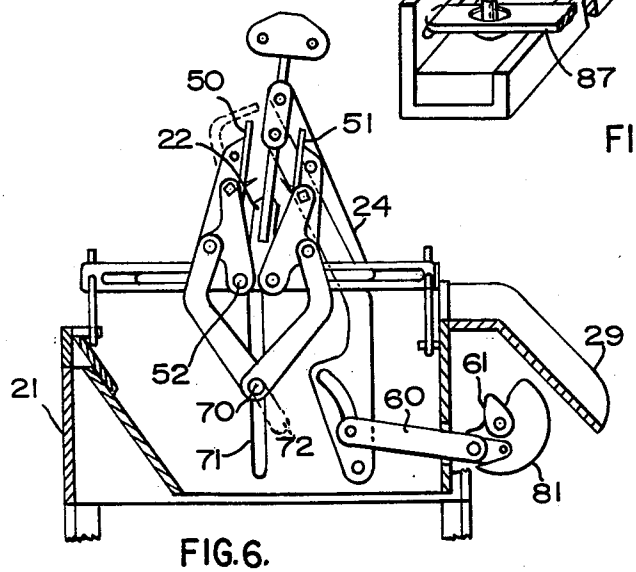



FIG. 6.

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BAG OPENING AND EMPTYING MACHINE

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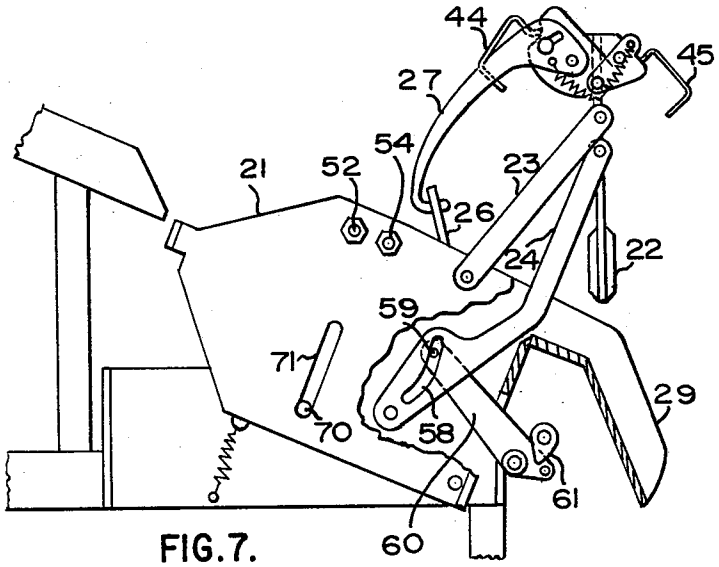



FIG.7.

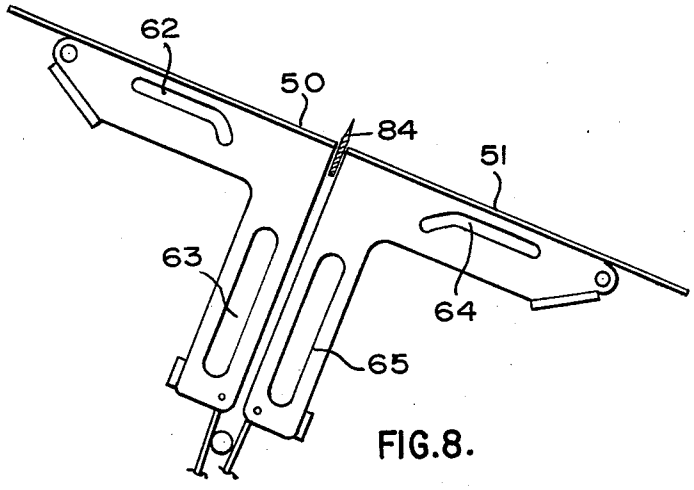



FIG.8.

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United States Patent Office 2,930,501 Patented Mar. 29, 1960



2,930,501

# BAG OPENING AND EMPTYING MACHINE

Maurice S. Cotterell, Peterborough, Ontario, Canada

Application May 2, 1958, Serial No. 732,572

1 Claim. (Cl. 214—305)

The present invention relates to an apparatus for opening and emptying bags of material.

It is common in many industries to obtain materials which have been packaged in large multiwalled paper bags of approximately 100 lbs. capacity. These materials must be removed from the bags after receipt prior to being processed. It has long been realized that opening and emptying bags of material by hand is far too slow and costly and therefore machines have been developed to replace manual labour. These machines however, have all suffered from certain disadvantages; one of the principal disadvantages is that they are not fully mechanised. Some hand operation is necessary especially that of disposing of the bag after it has been emptied and preparing the machinery for reception of the next bag. None of the existing machines for opening and emptying bags of material have been adaptable for attachment to existing machinery for processing materials and have therefore been unsatisfactory.

The present invention overcomes the disadvantages of these known machines by providing an apparatus for opening and emptying bags of material which is capable of readily being attached to material processing apparatus, the machine being designed to receive and empty bags from a feed conveyor as fast as the latter can be loaded. The apparatus according to the present invention is simple and inexpensive to operate, and disposes of the empty bags after the material has been removed.

The apparatus according to the present invention consists of a frame to which are mounted a chute for guiding the bags into place and an open ended box compartment containing a pair of collapsible platforms onto which the bag is placed. A bag opening device which may either be a travelling knife or a series of stationary knives operates between the two collapsible platforms. When a bag is placed on the two platforms and they begin to collapse, the bag is opened by the knife, the outer extremities of the bag being folded upward about a bag folding plate positioned over the joint between the two collapsing platforms. As the platforms collapse and fold about the bag folding plate the ends of the bag are brought into contact with the upper portion of the bag folding plate. The bag folding plate is provided with a pair of bag gripping arms which then close on the ends of the bag and hold the bag against the bag folding plate. The bag folding plate is then moved to a position outside the open ended box compartment and the bag gripping arms release the bag allowing the bag to fall away from the mechanism. A vibratory mechanism may be employed to ensure that the bag is empty before being gripped on the bag folding plate.

In the drawings which illustrate embodiments of the invention,

Figure 1 is a side elevation of the apparatus according to the invention,

Figure 2 is a plan view of the apparatus,

Figure 3 is a section in elevation of the lever linkage



which control the motion of the bag folding plate and the two folding platforms.

Figure 4 is an exploded perspective of the bag gripping arm operating mechanism,

Figure 5 is an elevation of the cam shaft of the apparatus,

Figure 6 is a sectional elevation of the apparatus with the folding platforms folded about the bag folding plate,

Figure 7 is a sectional elevation of the apparatus with the bag folding plate in the position where the bag is released,

Figure 8 is an elevation of the folding platforms,

Figure 9 illustrates an alternative embodiment with regard to the bag opening mechanism, and

Figure 10 illustrates the relationship of the slots in the sides of the box compartment.

The apparatus illustrated in Figure 1 comprises a main frame **28** at one end of which is mounted a chute **20** and at the other end of which an open ended box compartment **21** is pivoted on a shaft **43**. Box compartment **21** pivots inside main frame **28**. Mounted on the end of shaft **43** is a pulley **42** around which a drive belt **41** is connected. A motor **40** supplies driving power to the belt **41**. Mounted above and across the centre of the box compartment is a bag folding plate **22** which is supported by lever arms **23** and **24**, lever arm **23** being pivoted about axle **25**. Mounted on either side of bag folding plate **22** are a pair of bag gripping arms **44** and **45** which are operated by means of crank lever **27** and hook **26**. Chute **29** on the outer extremity of box compartment **21** carries the bags over the cam shaft.

The mechanism for operating the bag gripping arms is illustrated in exploded view of Figure 4. The bag gripping arms **44** and **45** which in their closed position bear against the two sides of bag folding plate **22** are connected to cam plates **31** and **30**, respectively. These cam plates are in turn mounted on pins **33** and **34**, respectively, attached to plate **32** which is mounted to one edge of bag folding plate **22**. The crank lever **27** is pivoted on pin **33** and is connected by means of slot **46** to pin **47** mounted on cam plate **31**, pin **48** on cam plate **31** rides in slot **49** on cam plate **30**. Cam plates **30** and **31** are spring loaded in such a manner that bag gripping arms **44** and **45** are urged against the sides of bag folding plate **22**.

Figure 2 is a plan view of the apparatus according to the present invention. Bag folding platforms **50** and **51** are mounted in the centre of box compartment **21**. Bag folding plate **22** being positioned above the space between the two platforms. The two platforms **50** and **51** are pivoted about pivot points **52**, **53** and **54**, **55**, respectively. Platforms **50** and **51** are provided with rows of barbs **56** and **57**, respectively.

Figure 3 illustrates a side view section of the lever mechanism for operating the folding platforms **50** and **51** and the bag folding plate **22**. As discussed previously bag folding plate **22** is mounted and controlled by means of lever arms **23** and **24**. In the bottom of arm **24**, a slot **58** has been cut. Pin **59** runs in slot **58** and is fixed to lever arm **60** which is controlled by cam **61**. Platforms **50** and **51** which are pivoted about points **52** and **54** have slots **62**, **63** and **64** and **65** cut in their side members, respectively. Lever **66** is pivoted about point **52** and has a pin which rides in slot **62**. Lever **67** is pivoted about point **54** and has a pin which rides in slot **64**. A pair of cranked arms **68** and **69**, are pivoted about pin **70** which rides in slot **71** cut in the sides of box compartment **21** and slot **72** cut in the sides of frame **28**. The upper ends of crank arms **68** and **69** are fixed by means of pins **73** and **74** to projecting portions of lever arms **66** and **67**. To the outer extremity of lever **66** a notched member **75**

is located. A vibrator **76** is attached to one side of main frame **28**.

Figure 5 illustrates the cam shaft and drive mechanism of the apparatus according to the present invention. Cam shaft **77** is driven by spur gear **78** mounted on one end of the shaft. Spur gear **78** is in turn driven by pinion gear **79** which is mounted on the shaft **43**. Cam shaft **77** carries cams **80, 81, 82, 83** and **84**. Cams **80** and **81** are operable against shoulders **85** and **86** to reciprocate the open ended box compartment **21** about axle **43**. Cam shaft **71** is mounted in pivots which are mounted on the end of open ended box compartment **21**. Cam **82** drives lever **83** to draw knife **84** across the bottom of the bag. Cams **61** on either end of the cam shaft operate levers **60** which are connected to levers **24** to operate the bag folding plate.

Figure 6 illustrates the embodiment of the present invention when the folding platforms **50** and **51** are tilted about bag folding plate **22**.

Figure 7 illustrates the apparatus during its cycle of operation when the bag gripping arms **44** and **45** have opened to release the bag over the side of the machine.

Figure 8 gives a detailed view of the two folding platforms **50** and **51**.

Figure 9 illustrates an alternative embodiment for cutting the bag. This embodiment may be used with bagged materials which are relatively heavy and flow freely. As the platforms **50** and **51** fold the bag bears against the cutting knives and is opened whereupon the contents of the bag falls freely out.

The operation of the apparatus according to the present invention as shown in the drawings is as follows:

Referring to Figure 1, a bag is delivered down the chute **20** onto the floating platforms **50** and **51**. The following sequence of operations of the machine is initiated. The motor **40** is energized and by means of belt **41** drives pulley **42** in a clockwise direction. Pulley **42** which is connected by means of shaft **43** to pinion gear **79** (Figure 5) which in turn drives spur gear **78** mounted on cam shaft **77**. Cam shaft **77** is rotated causing cam **82** to deflect lever **83** and thereby draw knife **84** across the bottom of the bag. Subsequent to this operation bag folding platforms **50** and **51** commence to fold about bag folding plate **22** (Figure 6) due to the lowering of open-ended box compartment **21** by cam **81** operating against shoulders **85** and **86**. As bag folding platforms **50** and **51** fold the bag about bag folding plate **22** notch member **75** is brought into contact with crank lever **27** and causes bag gripping arms **44** and **45** (Figure 1) to grip the ends of the bag.

A vibrator **76** is incorporated on one end of frame **28** in order to ensure that the contents of the bag flow freely



therefrom during the above operations. After the bag has been emptied the bag folding plate **22** is caused to move to the right by the action of cam **61** on levers **60** and **24**. At the extreme limit of the motion (Figure 7) of bag floating plate **22** crank arm **27** engages with a hook **26** which causes bag gripping arms **44** and **45** to loose the bag which is then conducted away from the machine by a chute **29**.

Although in the above description, the activating device is shown as a motor driven cam shaft, all the necessary motions may be obtained by other means such as air or hydraulically operated cylinders, working by means of slots and cam faces embodied in the machine frame.

The machine will work at a predetermined time cyle, initiated by a full bag entering the machine operating a switch, and means are adapted at the end of the entry chute **20** to prevent the next bag entering the machine before the cycle is completed.

What I claim as my invention is:

An apparatus for opening and emptying a bag of material comprising a frame, an axle mounted in gearings set into the sides of said frame near one end thereof; an open ended box compartment pivoted on said axle and positioned inside said frame; a pair of pivotally mounted platforms inside said box compartment; a cutting mechanism mounted in said box compartment between said platforms; a bag folding plate mounted above said cutting mechanism; a pair of bag gripping arms, one mounted on each side of said bag folding plate; a chute adapted to deliver a bag onto said platforms; driving means for reciprocating said box compartment about said axle; first coupling means between said box compartment and said platforms adapted to tilt said platforms so the centre edges are lowered and the outer edges are raised when said box compartment is driven by said driving means, thereby to fold said bag about said bag folding plate; second coupling means adapted to close said bag gripping arms against the sides of said bag folding plate after said bag has been folded about said bag folding plate; bag shaking means adapted to shake said bag after it has been gripped by said bag gripping arms, thereby to ensure the emptying of said bag, third coupling means adapted to displace said bag folding plate beyond one end of said box compartment and to actuate said second coupling means to open said bag gripping arms thereby to release said bag for disposal.

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