Nov. 1, 1955 R. O. WILSON 2,722,358

BAG FILLING MACHINE

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Fig. 1.

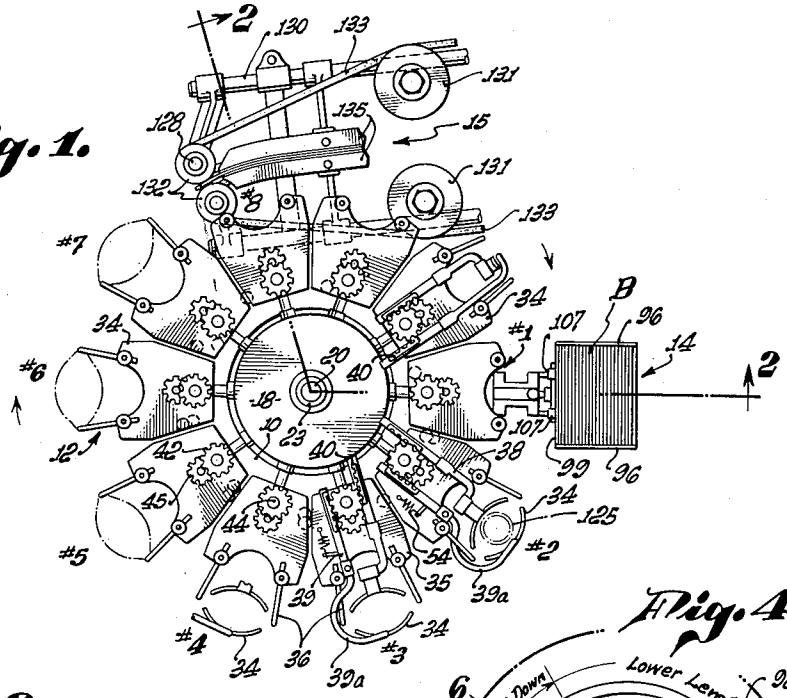


Fig. 4.

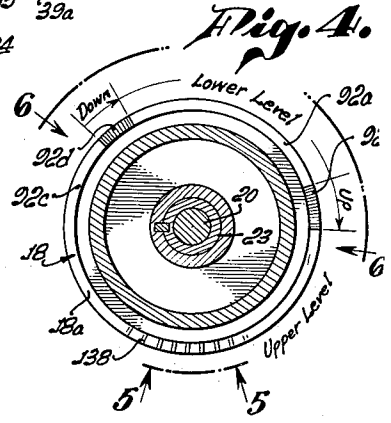


Fig. 3.

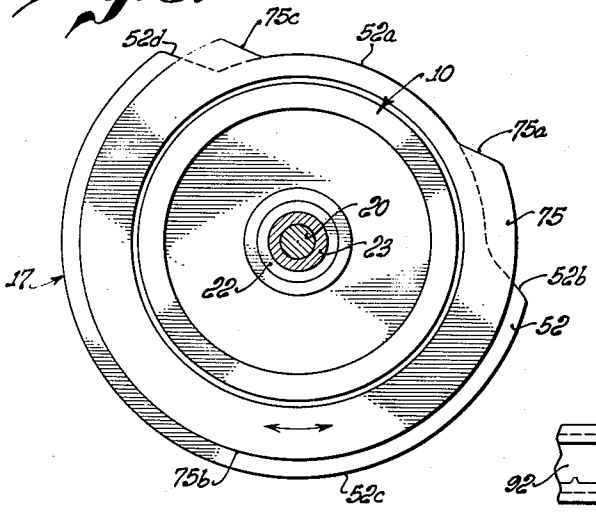


Fig. 5.

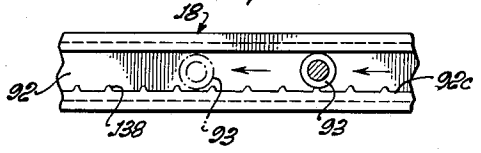
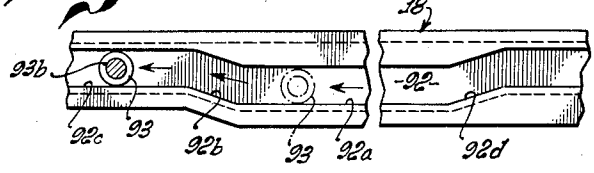


Fig. 6.



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BAG FILLING MACHINE

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Fig. 2.

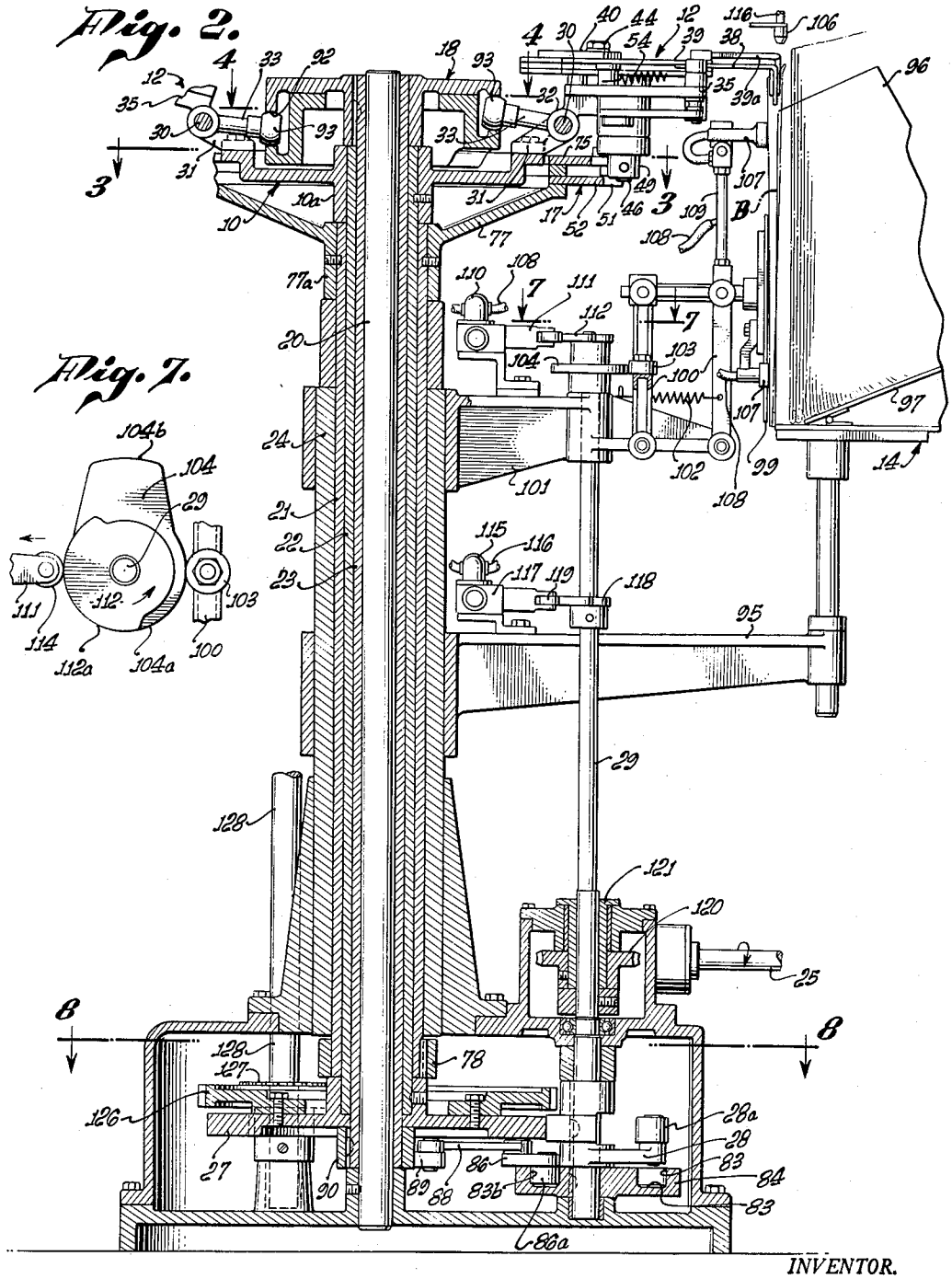


Fig. 7.

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BAG FILLING MACHINE

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Fig. 8.

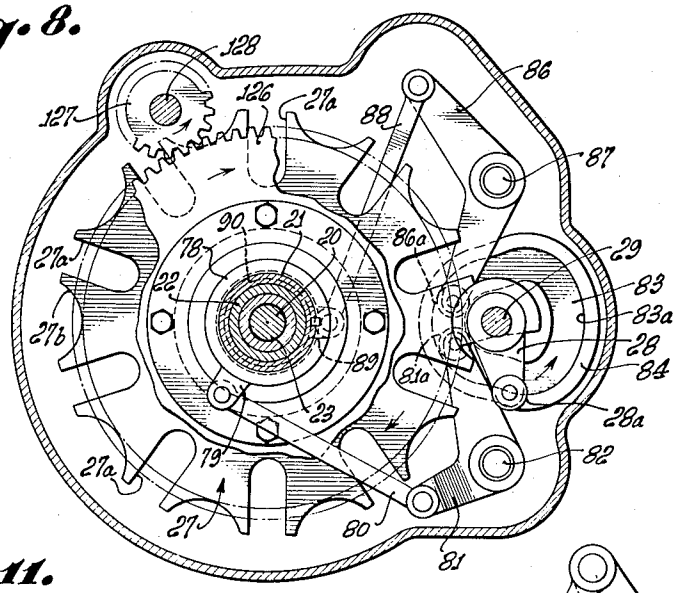


Fig. 11.

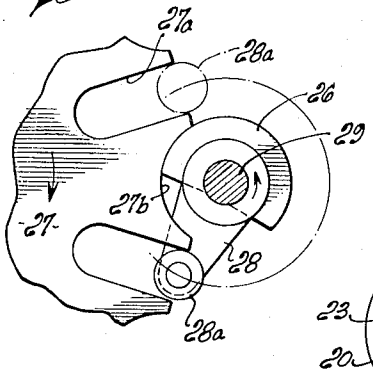


Fig. 9.

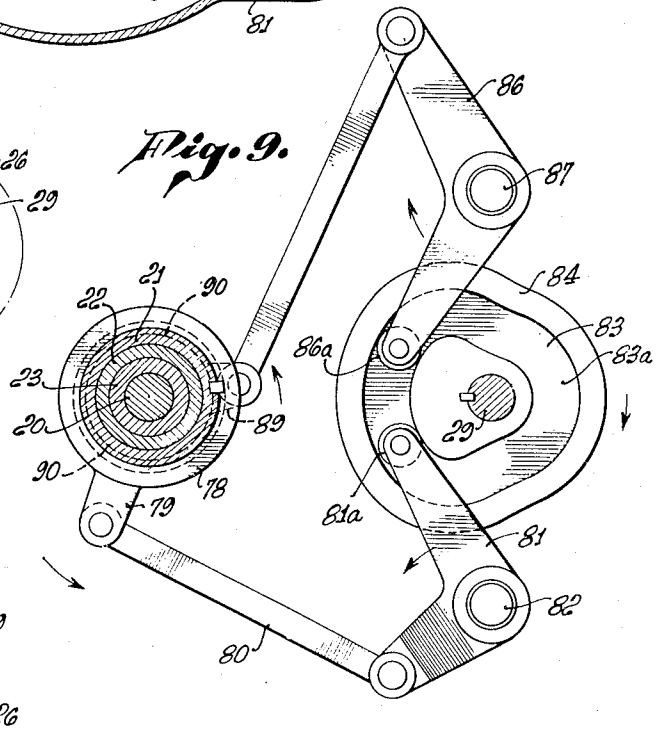
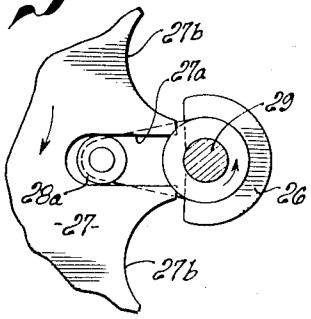


Fig. 10.



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Fig. 12.

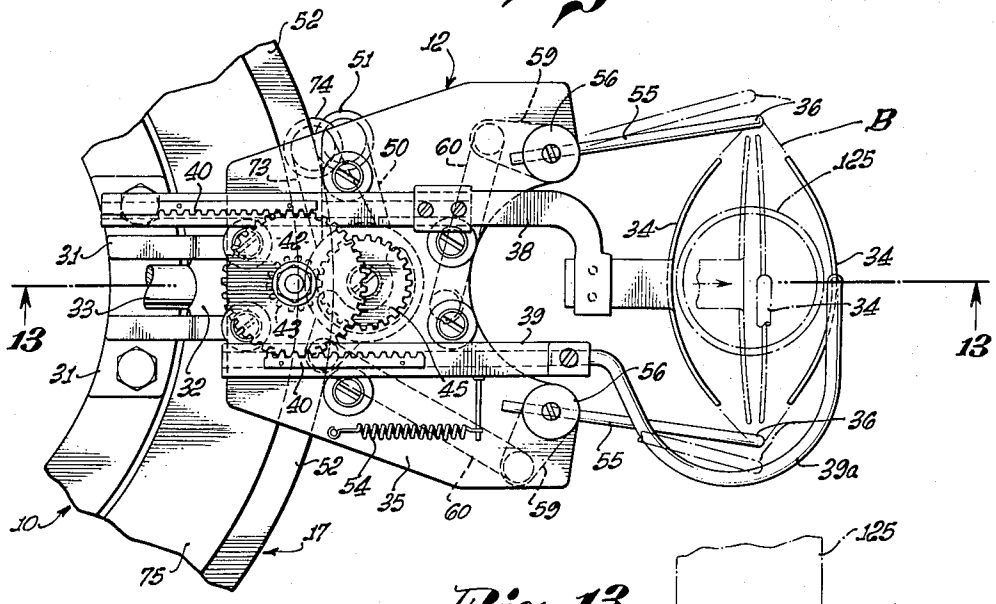


Fig. 13.

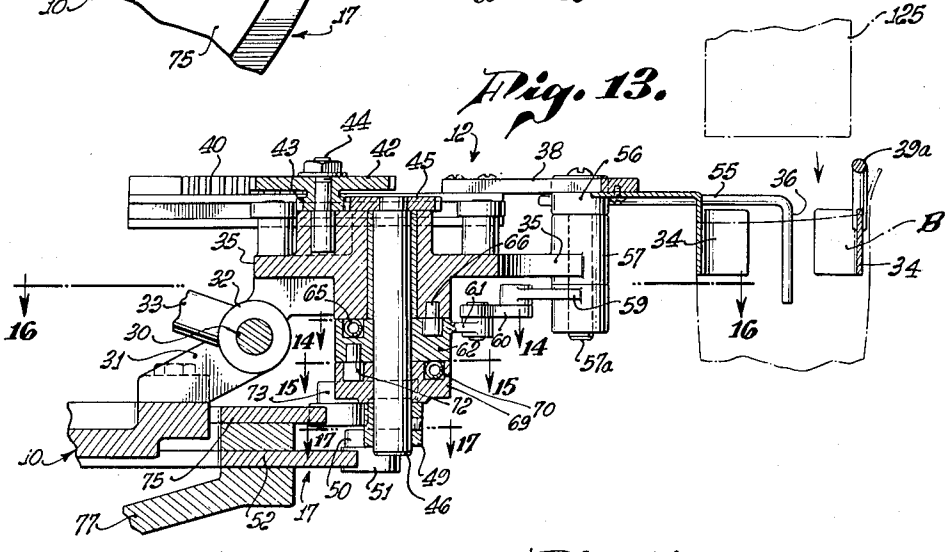


Fig. 15.

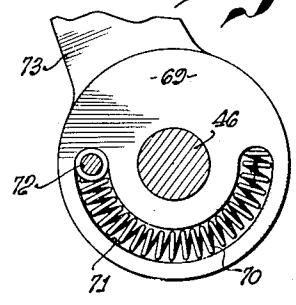
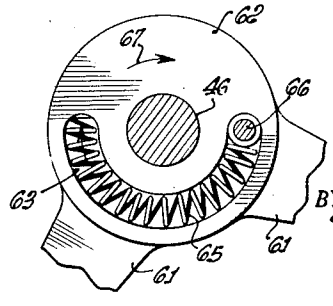


Fig. 14.



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Fig. 16.

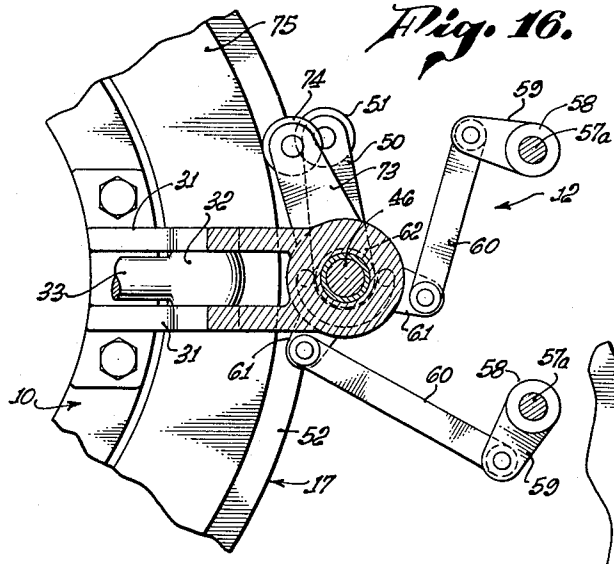


Fig. 17.

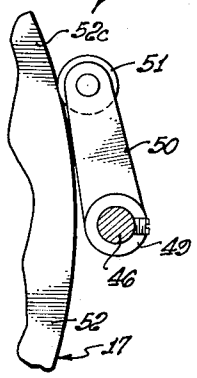
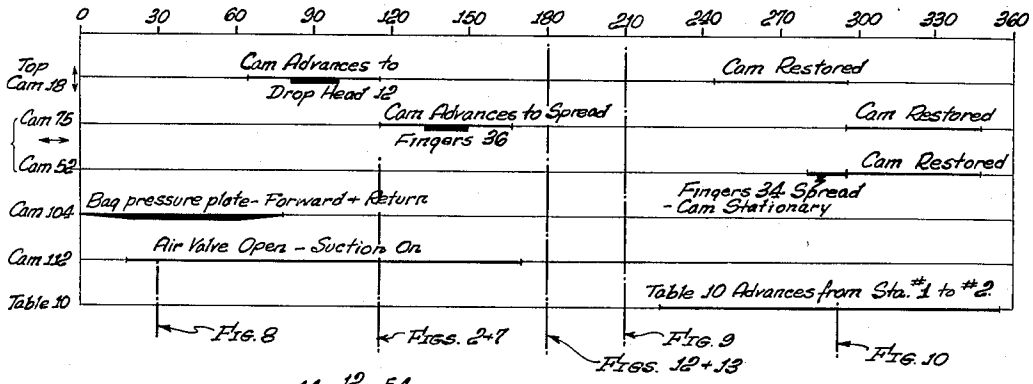


Fig. 19.



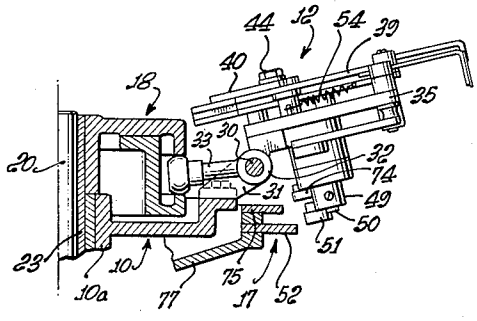


Fig. 18.

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BAG FILLING MACHINE

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Fig. 21.

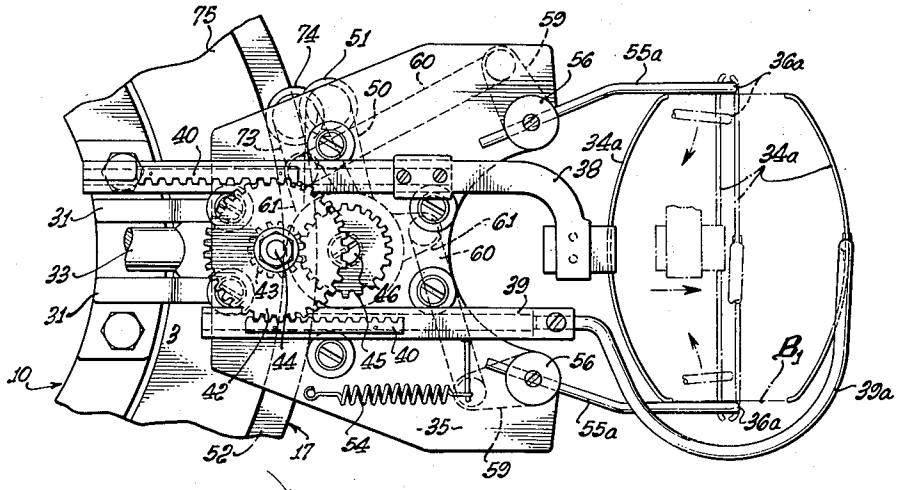


Fig. 22.

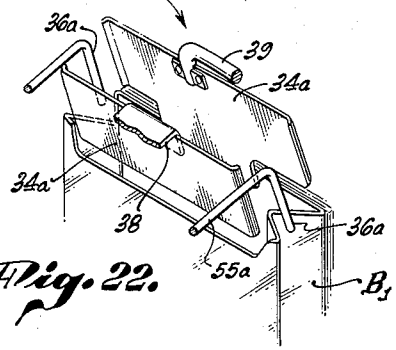


Fig. 23.

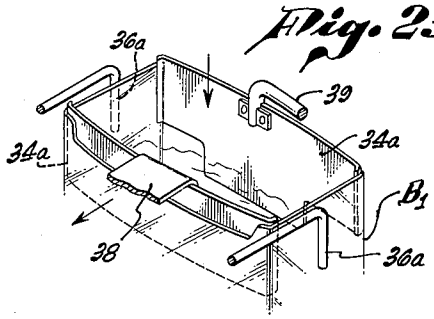


Fig. 24.

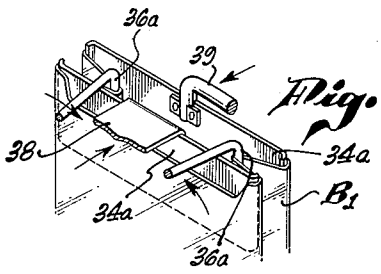
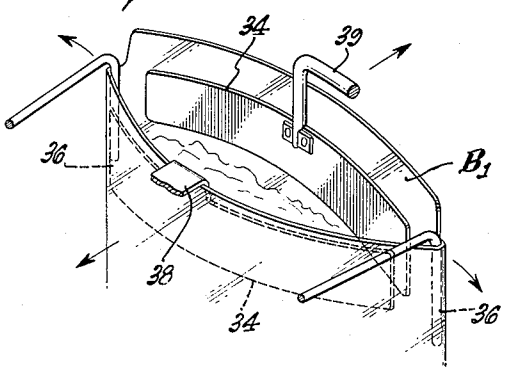


Fig. 20.



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ATTORNEYS.

United States Patent Office

2,722,358

Patented Nov. 1, 1955

2,722,358

BAG FILLING MACHINE

Ray O. Wilson, Los Angeles, Calif., assignor to The Woodman Company, Inc., Decatur, Ga., a corporation of Georgia

Application February 26, 1951, Serial No. 212,726

20 Claims. (Cl. 226—49)

The present invention relates generally to bag handling machines and more particularly to a bag filling machine which automatically opens a flattened bag, presents the opened bag to a source of material to be placed in the bag, and then delivers the filled bag to a bag sealing device or other suitable mechanism.

A great many varieties of products, particularly food products such as potato chips, pop corn, macaroni and the like, are packaged in bags made of cellophane or other clear synthetic plastic material. Ordinarily, the operations of opening and filling the bags are carried out to a greater or lesser extent by hand. Mechanical devices have been designed to assist an operator in one or more of the several steps involved in packaging material in this way but no fully automatic machine is known which is able to perform all of these steps. Since these packaging operations are routine they become very monotonous when repeated and it is difficult for an operator to maintain a high rate of output over an extended time. One of the big advantages of performing these operations by machinery is the increased rate of output and consequently the greatly decreased cost of performing these operations.

Hence it becomes a general object of my invention to provide a completely automatic machine for filling bags.

More particularly, it is an object of my invention to provide a mechanism that opens a bag, carries it from the point at which bags are supplied to a location at which the bag is filled, and then carries the filled bag on to another location where the bag is removed from the machine for sealing or other purposes.

It is also an object of the invention to provide mechanism forming a part of a machine of the character described that holds a bag open and supports it as the bag is moved from one position to another and filled.

It is also an object of the invention to provide means for mounting and successively operating a plurality of such mechanisms in timed relation with each other in order to obtain a higher output than would be possible with a single bag manipulating mechanism.

These objects and advantages of my invention are attained by rotatably mounting a table on a frame and mounting on the table a plurality of bag holding heads. Each of the heads is provided with a plurality of movable members each having at one end a bag engaging and supporting finger. In order to move the fingers relative to each other in the proper timed relationship, there is provided a plurality of annular cams which are concentric with the head.

Each bag holding head is mounted on the table to tilt in a manner that raises or lowers the bag engaging and supporting fingers for the purpose of inserting and removing these fingers from a bag. Another cam concentric with the table is provided to effect the proper tilting movement of the heads. The cams and the table being concentric with each other are conveniently driven by an assembly of concentric sleeves which are connected at one end to driving means which moves the table intermittently in a forward direction while the cams have an oscillating movement since they periodically advance and are then restored to their initial position. This driving mechanism is preferably driven from a final drive shaft to which other cams are connected in order to bring about a proper timing of the motions of other parts with respect to the movement of the table.

How the above objects and advantages of my invention, as well as others not specifically referred to herein, are attained will be more readily understood by reference to the following description and to the annexed drawings, in which:

Fig. 1 is a plan view of a bag handling and filling machine constructed according to my invention, many of the duplicate parts being broken away or removed for simplicity of illustration:

Fig. 2 is an enlarged vertical median section through the machine of Fig. 1 on line **2—2** thereof;

Fig. 3 is a plan view of the annular cam assembly for controlling movement of the bag holding fingers taken on line **3—3** of Fig. 2;

Fig. 4 is a partial horizontal section on line **4—4** of Fig. 2 through the top cam for raising and lowering the bag holding fingers;

Fig. 5 is a fragmentary developed side elevation of the top cam, on line **5—5** of Fig. 4;

Fig. 6 is a view similar to Fig. 5 but taken on line **6—6** of Fig. 4;

Fig. 7 is a fragmentary plan view on line **7—7** of Fig. 2 illustrating the cams operating mechanism for controlling removal of the bags from the magazine;

Fig. 8 is a horizontal section and plan view on line **8—8** of Fig. 2 illustrating the drive for intermittently advancing the table and for oscillating the two cams concentric therewith;

Fig. 9 is an enlarged fragment of Fig. 8 showing only the rotating cam and its follower for oscillating the upper cams;

Figs. 10 and 11 are enlarged fragments of Fig. 8 showing successive positions of the Geneva drive;

Fig. 12 is an enlarged fragmentary plan view showing a portion of the rotating table and one complete assembly carried thereby of bag opening and holding fingers;

Fig. 13 is a fragmentary vertical transverse section on line **13—13** of Fig. 12;

Fig. 14 is a fragmentary plan view on line **14—14** of Fig. 13;

Fig. 15 is a fragmentary plan view on line **15—15** of Fig. 13;

Fig. 16 is a fragmentary plan and section on line **16—16** of Fig. 13;

Fig. 17 is a fragmentary plan on line **17—17** of Fig. 13;

Fig. 18 is a fragmentary view similar to Fig. 13 showing the assembly tilted with the bag holding fingers in raised position;

Fig. 19 is a chart showing the relative timing of various operations during one revolution of the final drive shaft;

Fig. 20 is a fragmentary perspective showing the bag holding fingers and how they engage the sides of one type of bag;

Fig. 21 is a view similar to Fig. 13 but showing a modified form of finger assembly adapted to hold a different type of bag; and

Figs. 22, 23 and 24 are fragmentary perspective views of the bag holding fingers of Fig. 21 showing respectively the steps of inserting the fingers into the bag, holding the bag open, and closing the bag.

General description

As an introduction to the more detailed description which follows, the principle elements of the machine will

first be pointed out. The machine has a rotating table indicated generally at **10** (Fig. 2) which is driven intermittently and which carries a plurality of traveling heads or assemblies individually indicated generally at **12**, each of which includes a plurality of members opening and supporting paper bags terminating in finger-like portions. A supply of paper bags is held in magazine **14**, and as each assembly **12** moves opposite the magazine, the fingers drop into a bag and spread apart to engage the side walls of the bag. The bag is then opened as the table moves the assembly in a clockwise direction, as viewed in Fig. 1, to a filling position underneath a spout which feeds into the bag the contents, such as potato chips, macaroni, or other material to be packaged. The filled bag is then advanced by steps as table **10** rotates until the bag is finally delivered to the rails of sealing apparatus indicated generally at **15**, when the fingers are moved toward each other and lifted out of engagement with the bag. The spreading action of the fingers is controlled by an assembly **17** of annular cams, while the vertical component of finger motion is controlled by an upper cam assembly **18**, cam assemblies **17** and **18** being movable relative to table **10** and each head **12**. Table **10** and the two cam assemblies **17** and **18** are actuated in synchronism with each other by three concentric, separately movable sleeves **21, 22, 23** which surround central post **20** and are inclosed within housing **24**. These sleeves are actuated by suitable drive mechanism connected to their lower ends and receiving power from final drive shaft **29** which is operatively connected to a driving motor of any suitable kind or other desired source of power, not shown, through primary drive shaft **25**.

Table **10** is located at the top of the machine. The hub **10***a* of table **10** is attached to middle sleeve **22**, the table being rotated by the sleeve. At its lower end, sleeve **22** is attached to the hub of gear **27** which is shown in plan in Fig. 8. Gear **27** is driven by arm **28** mounted upon final drive shaft **29**.

Gear **27** and arm **28** are the driven and driving members respectively of a Geneva mechanism. Gear **27** has a series of angularly spaced, radially extending slots **27***a* which open to the periphery of the gear. The number of slots equals the number of assemblies **12**. Shaft **29** and arm **28** revolve continuously at a constant speed. Roller **28***a* on the end of arm **28** enters a slot **27***a* as indicated by dot-dash line in Fig. 11, and engages the sides of the slot to advance gear wheel clockwise as shown in Fig. 12. When the driven gear has been advanced an amount equal to the angular spacing between successive slots **27***a*, the roller leaves the slot as shown in full lines in Fig. 11. Gear **27** is thus intermittently moved, always in a forward direction, and remains stationary between such movements.

To hold the driven gear fixed between periods of advancement, an escapement-type of locking mechanism is provided consisting of circular indentations **27***b* in the rim of gear **27** between slots **27***a*, and a mating, approximately semi-circular locking member **26** mounted on the hub of arm **28**. As shown in Figs. 8 and 11, indentations **27***b* conform to the curvature of the periphery of the locking member **26** to engage the periphery of gear **27** at successive indentations and thus hold it against rotation. With this construction, the driven gear is advanced only intermittently by the driving element even though the driving element, in this case arm **28**, revolves continuously. Another result of this construction is that for each complete revolution of shaft **29** and gear **28**, gear **27** and sleeve **22** are turned a predetermined fraction of one revolution, the fraction being one-tenth in the present case. Of course, any other suitable type of intermittent drive, such as a pawl or interrupted gear, may be substituted for the Geneva elements **27** and **28**; but the Geneva drive is preferred because of its smooth acceleration and deceleration.

Rotating table **10** has mounted upon it a plurality of bag-holding heads or finger assemblies **12**, there being ten such heads in the embodiment of the machine illustrated herein; but it will be understood that my invention is not limited to any specific number of these heads. Each head **12** is pivotally mounted on a pin **30** held in bracket **31** which is rigidly fastened to the raised marginal flange of table **10**, as shown particularly in Figs. 2 and 13. The axes of the several pins **30** lie in a common plane parallel to the plane of revolution of table **10**, which in this case is horizontal so that each head **12** is capable of individual swinging movement in a vertical arc about a horizontal axis.

Operating heads

Each head **12** has a cylindrical bearing **32** which journals pin **30** and has an arm **33** that extends radially inward from pivot pin **30**. Also formed integrally with bearing **32** is the flat, plate-like portion **35** of the head to which the various moving parts are connected. This portion **35** of the head extends generally outward of bearing **32**.

As may be seen particularly from Figs. 12 and 13, each head assembly **12** is provided with a plurality of members for manipulating the paper bags, these members being divided into two pairs which cooperate with each other to open a bag and hold it in open position for filling. These bag manipulating members terminate in bag engaging portions which hereinafter are referred to as fingers, the fingers of one pair being designated as **34** and the fingers of the other pair as **36**. The two fingers **34** of the first pair of bag manipulating elements are plate-like members that are resilient to conform to the sides of the bag, as may be seen from Figs. 12 and 20; and the fingers are attached one to the outer end of arms **38** and **39**, which arms are slidably mounted on headplate **35** for longitudinal movement. One of the arms, here **39**, has a curved part **39***a* shaped to support the far finger **34** without crossing the open mouth of the bag B (see Fig. 12). The two arms **38** and **39** are relatively movable in order to move the two bag holding fingers **34** toward and away from each other in order to engage and disengage the bag. Each arm **38** and **39** carires at its inner end a rack **40**, the two racks being disposed parallel to each other and engaging gear **42** on opposite sides thereof. As may be seen particularly from Fig. 13, gear **42** has on its underside, integrally formed therewith, a second smaller gear **43**, the two gears being rotatably mounted upon fixed pin **44**. Gear **43** meshes with gear **45** securely affixed to the upper end of shaft **46** which is rotatably mounted in a suitable journal bearing in plate **35**.

To the lower end of the shaft **46**, there is secured hub **49** (see Fig. 17) which carries an integrally formed arm **50** on the outer end of which is mounted roller **51**. Roller **51** is a follower which rides against the outer periphery of annular cam **52** as shown also in Figs. 12 and 16. The construction of the cam will be described in detail later.

As shown in Fig. 12, above plate **35** is tension spring **54** which is fixed at one end to plate **35** and attached at the other end to finger carrying arm **39**. The pull of spring **54** normally urges inwardly arm **39** and the finger **34** carried thereby. Since the two arms **38** and **39** are mechanically interconnected through racks **40** and gear **42**, arms **38** and **39** and the two fingers **34** always move equally and simultaneously but in opposite directions. Consequently, the pull of spring **54** is also communicated to arm **38** which is thus normally urged outwardly until the bag engaging finger **34** carried thereby occupies the dot-dash position of Fig. 12. Here it is close to or in contact with the other finger **34**, also in dot-dash lines. This pull of the spring is also communicated through gears **42, 43** and **45** to shaft **46**, causing shaft **46** to turn until roller **51** engages lower cam ring **52**. As will be explained in greater detail

later, the two fingers **34** occupy the collapsed or retracted position in which they are substantially in engagement with each other only when follower **51** engages the "dwell" portion **52***a* of cam **52** which is the portion of cam **52** of minimum diameter. An increase in the diameter of the cam at **52***b* to the larger diameter section **52***c* causes follower **51** to move radially outward from the center of the machine, rotating shaft **46** in a clockwise direction as viewed from above. This angular movement of the shaft is magnified through the gear train **45**, **43**, **42** and transmitted to racks **40** so that fingers **34** are spread apart, their movement being in a direction substantially radial of table **10**.

Each operating head **12** also carries a second pair of bag engaging fingers **36** which are formed as the downwardly bent forward ends of horizontal rods **55**, shown in Figs. 13 and 20. The other or rear ends of rods **55** are each held in a knob **56** rotatably mounted on plate **35** by a pin **57***a* extending vertically through boss **57**. To the lower end of the pin is affixed collar **58** having an arm **59** by means of which the collar and pin may be rotated.

The two arms **59**, each of which controls the swinging movement of one finger arm **55**, are individually connected by links **60** to two angularly spaced arms **61**, see Fig. 16, formed integrally with collar **62** which is rotatably mounted upon shaft **46**. Collar **62** is free to turn on shaft **46**, but it is resiliently connected to plate **35** in order to apply to the collar a force which normally tends to spread fingers **36** apart to the dot-dash position of Fig. 12.

For this purpose, collar **62** has in its upper face a semi-circular slot **63**, as shown in Fig. 14. In this slot is compression spring **65** which at one end of the slot bears against the collar. At the other end, spring **65** bears against pin **66** which extends upwardly from the collar into a hole in headplate **35** of the same diameter as the upper end of pin **66**. Thus the pin is fixed relative to body **35** but can move within the slot in the collar as the collar is rotated in a counter-clockwise direction viewed in Fig. 13, which movement compresses spring **65**. The normal expansive force of spring **65** tends to rotate collar **62** in a clockwise direction indicated by arrow **67**, pin **66** being fixed, and such movement of the collar is communicated through links **60** and arms **59** to buttons **56** which rotate to bring fingers **36** to the dot-dash position of Fig. 12. Although the movement of each finger **36** is, strictly speaking, in an arc and therefore not exactly perpendicular at all points to the direction of movement of fingers **34**, which move in linear paths, the movement of the two fingers **36** may be described as being in a direction transverse to the direction of movement of fingers **34**.

Also loosely mounted upon shaft **46** and directly below collar **62**, is another similar collar **69**. The two collars are resiliently interconnected in a manner to allow limited relative rotation. Lower collar **69** carries compression spring **70** in an arcuate slot **71** in the upper face of the collar, as shown in Fig. 15. Spring **70** bears at one end against pin **72** in the slot, the pin extending upwardly from collar **69** into a bore in the underside of collar **62**. The other end of compression spring **70** bears against the body of collar **69** at the opposite end of the slot. It will be seen by a comparison of Figs. 15 and 14 that pins **72** and **66** normally are at or near the opposite ends of their respective slots, compared with each other. Thus clockwise torque is transmitted from collar **69** through spring **70** to pin **72** and then to collar **62**; while torque in a counterclockwise direction (as viewed in Fig. 15) is transmitted directly from the collar to pin **72**.

Springs **65** and **70** provide a force which constantly urges arms **55** and fingers **36** toward the separated position shown in dot-dash lines in Fig. 12. As it will become apparent in further description, this pressure of the fingers keeps them in constant engagement with the side walls of the paper bag and also keeps the bag walls tight at all times. Furthermore, the two springs limit the force which can be applied to the bags by fingers **36** to the strength of the weaker of the two springs. In this way the fingers may be moved together or apart by cam means subsequently described while the resilient connection afforded by the pin and spring arrangement not only limits the amount of force applied to the paper bag by fingers **36** to values permitted by the strength of the paper bag but also permits a variation in the position of the fingers when inside a bag to accommodate them to any inequalities in the size of the bags.

Finger operating cam

Collar **69** has a radially extending arm **73** which carries on its outer end roller **74**. Roller **74** rides over the outer periphery of upper cam ring **75** of assembly **17** (see Figs. 12 and 16), the contact between the cam follower and the cam causing oscillation of arm **73** and collar **69** as the outside diameter of cam **75** varies. In this way cam **75** controls the movement of bag holding fingers **36**.

The two cams **52** and **75** comprising cam assembly **17** are annular in shape and are arranged one above the other. They surround and are at approximately the same level as table **10**. The two cams are fixed relative to each other and are attached to the upper end of conically shaped support **77**. This support is provided at its inner and lower portion with hub **77***a* by which the housing is secured in any suitable way to outer sleeve **21**, as shown in Fig. 2.

Cam drives

In order to obtain relative movement between ring cams **52** and **75** and their respective followers **51** and **74** to operate the bag holding fingers, cam assembly **17** oscillates about central shaft **20**. This oscillatory motion is imparted to the cam assembly through outer sleeve **21** which is driven at its lower end by collar **78** which is affixed to the sleeve in any suitable manner. Collar **78** has a radial arm **79** which is operatively connected to one end of link **80** as shown in Figs. 8 and 9, the other end of the link being connected to one arm of bell crank **81** which is pivotally mounted at **82** to the base of the main frame of the machine. The other arm of bell crank **81** carries a roller **81***a* which rides in cam slot **83** of rotating cam member **84** keyed, or otherwise fastened, to drive shaft **29**. Cam slot **83** has two arcuate sections **83***a* and **83***b* of constant radius, the latter section being of greater radius than the former. Connecting these two arcuate sections, are two straight transition sections of changing radius with respect to the center of shaft **29** which is the axis of rotation of cam member **84**. As shaft **29** revolves cam **84**, follower in slot **83** remains fixed relative to the cam axis while in one of sections **83***a* or **83***b* of uniform radius; but in the straight transition sections of changing radius, the follower moves toward or away from the axis of shaft **29**. This motion causes bell crank **81** to oscillate about its pivot **82**. The oscillatory motion of bell crank **81** is communicated by link **80** to arm **79** and collar **78**, thus producing an oscillatory motion of outer sleeve **21**, cam support **77**, and cam assembly **17**. The oscillation of cam assembly **17** produces movement of the two cams **52** and **75** relative to heads **12** as the cams are periodically advanced and subsequently restored to starting position.

As also seen in Fig. 9, there is a second bell crank **86**, similar to crank **81**, pivotally mounted to the machine frame at **87**. One arm of the bell crank carries follower **86***a* which also rides in cam slot **83** to oscillate bell crank **86** as cam **84** rotates, in the same manner as just described for crank **84**. This oscillatory motion of bell crank **86** is communicated through link **88** to arm **89** of collar **90**. Collar **90** is keyed, or otherwise fastened, to innermost sleeve **23** at the lower end of the sleeve, as shown in Fig. 2. The upper end of the sleeve is secured to upper cam

18 which tilts the heads and thus controls the vertical movement of the bag engaging fingers in order to insert and remove the fingers from a bag.

Head tilting cam

Cam **18** is circular in outline when viewed in plan, as in Fig. 1. As shown in Fig. 2, it is preferably made in two parts fastened together in order to facilitate formation of a horizontally facing cam slot **92** in the vertical peripheral surface of the cam. This cam slot **92** around cam **18** has a uniform width adapted to receive a roller follower **93** on the inner end of arm **33** of each head **12**. Since the center of gravity of each operating head lies radially outward of the pivot **30**, each follower **93** is gravity biased to press against the upper face of slot **92**. Although, for this reason the upper face may be regarded as the primary face for operating purposes, it is parallel to the lower face which is shown in plan in Fig. 4 at **18***a*.

Starting with the level section of slot **92** indicated in Fig. 4 at **92***a*, the slot rises over a short distance at **92***b*, This inclined portion of the slot may be considered to be an upward incline because the relative movement of the cam and follower **93**, as indicated by the arrows in Fig. 6, is such as to elevate the follower as it moves around the cam. After the inclined section **92***b*, the cam slot proceeds around the cam at what may be termed the upper level **92***c* until a downwardly inclined section **92***d* is reached at which point the slot returns to the lower level **92***a*, The section **92***d* is regarded as downwardly inclined because each cam follower **93** moves downwardly as it passes through this section.

For reasons which will be more fully explained later, I prefer that a portion of the upper level **92***c* have a toothed or serrated outline as illustrated in Fig. 5. However, this configuration is optional and may be omitted if desired. Also, the length of this wavy section is optional and occupies only a portion of the full length of the upper level **92***c*.

Bag supply

Paper pags B are fed to the operating heads from magazine **14**, shown in Figs. 1 and 2. The magazine is supported on arm **95** carried on housing **24**. This arrangement permits the magazine to be raised or lowered or shifted angularly around the central post to bring it into the proper position to feed bags to the operating heads.

Although any other suitable type of bag feeding magazine may be used, I have found that the arrangement herein shown and described is particularly advantageous. This magazine comprises a pair of upright parallel side walls **96** between which is located a downwardly and inwardly inclined plate **97** which forms the bottom of the magazine and upon which the bags rest. Bags are inserted in the magazine from the rear, the side away from the machine, and move forwardly to the open front of the magazine which faces the operating heads. The bags in the magazine are more or less loosely stacked and as they move forward they straighten up so that the front bag is substantially vertical. This position of the bags is maintained by reciprocating pressure plate **99** which part of the time presses lightly against the front bag of the stack to keep it in the desired position, but which is periodically retracted to the position of Fig. 2 in order to permit the foremost bag to be withdrawn from the magazine. Plate **99** has a vertical operating face which is always maintained in this position because the plate is mounted by means of parallelogram linkage **100** upon fixed bracket **101** which in turn is carried upon housing **24**.

Parallelogram linkage **100** has pivotal connections at its four corners that allow plate **99** to move back and forth in a horizontal direction. Spring **102** is attached at one end to bracket **101** and at the other end to an element of parallelogram **100** and normally pulls the pressure plate away from the bags and the magazine.

Movement of the plate against the bags in opposition to spring **102** is produced by engagement of roller **103**, which is mounted on the parallelogram linkage, with rotating cam **104**, which is mounted on the upper end of drive shaft **29**, as shown in Figs. 2 and 7. While roller **103** engages the dwell portion **104***a* of cam **104**, which portion is of constant diameter, plate **99** is retracted as in Fig. 2; but as the roller moves on to the cam portion **104***b* of larger diameter, plate **99** is moved into engagement with the bags in magazine **14** and held there so long as the roller rides against the cam section **104***b*.

In order to receive fingers **34** and **36**, the front bag in the magazine is opened by pulling the leading wall of the bag away from the magazine, that is toward the left as viewed in Fig. 2 and then opening the bag fully by an air blast. This is done with air nozzle **106** directly above the front bag and one or more suction cups **107** engaging the leading wall of the bag. The air blast into the bag is adequate to open the bag once it is pulled free of the magazine by the suction cups. Suction cups **107** are mounted upon parallalogram linkage **100** and consequently move relative to the bags in magazine **14**, the forward faces of the cups being approximately vertically aligned with the operating face of pressure plate **99**.

Suction cups **107** are connected to a vacuum pump of suitable characteristics, not shown in the drawings, but which will be readily understood by those skilled in the art. Vacuum may be applied to the top cups through any suitable means, here shown as including flexible hose **108** and tube **109** which is also used as part of the structure for supporting the upper vacuum cups in place on linkage **100**. Another branch of hose **108** is connected directly to the lower cups **107**.

In order to control the intermittent application of vacuum to all cups **107**, hose line **108** is provided with solenoid operated valve **110** which is normally closed, the valve being mounted upon switch **111** which controls the action of the solenoid. Switch **111** is actuated by cam **112** attached to the upper end of drive shaft **29** just above cam **104**. Cam **112** turns in contact with roller **114** on the operating arm of switch **111**. Cam **112** has operating section **112***a* of larger diameter which, when it engages roller **114** as in Fig. 7, moves the operating arm of switch **111** to a position in which the switch is closed, thus energizing the solenoid of valve **110** and opening the valve. When valve **110** is open, the vacuum pump is connected through lines **108** to cups **107**, causing the forward wall of the leading bag to adhere to these cups.

In order to control the timing and duration of the supply of compressed air to nozzle **106**, a solenoid operated valve **115** is placed in the supply line **116** which leads from a suitable source of compressed air, not shown in the drawings, to nozzle **106**. In the drawings, only fragments of airline **116** are shown at the nozzle and the solenoid valve since the location of this line is immaterial and its construction may be of any conventional type. Valve **115** is normally closed, shutting off the air supply to nozzle **106**. The valve may be mounted upon the body of switch **117** which controls the action of the solenoid in the air valve. The switch in turn is actuated by rotating cam **118** fastened on final drive shaft **29** and in contact with roller **119** on the operating arm of switch **117**. Cam **118** is provided with an operating section of larger diameter which, when in engagement with roller **119**, moves the operating arm of switch **117** to a position in which switch is closed, thus energizing the solenoid of valve **115** and allowing air to pass through airline **116** to nozzle **106** above the leading bag in the magazine. This air supply is maintained for a sufficient length of time to insure that the bag is fully opened. After this cam roller **119** moves to a section on cam **118** of smaller diameter at which time control switch **117** is opened and

air valve **115** is allowed to return to its normal closed position.

Common drive

It will be apparent from the foregoing description that shaft **29** is the common final drive to all of a number of different elements; and since these several elements are driven from shaft **29**, they are all driven in timed relation to each other and to the shaft. Cams **112**, **104**, **118** and **84** and Geneva arm **28** are all drivingly connected to shaft **29** and the time relation between the motions which they control is determined by the angular positions of these elements relative to shaft **29** which is a common base.

Drive shaft **29** is driven from primary drive shaft **25** which may be connected directly to a motor, not shown, or other suitable source of power, or it may well be the output shaft of a variable speed unit of any conventional style. Shaft **25** is drivingly connected to shaft **29**, as by a worm and gear arrangement. The worm is not shown in the drawings but the driven gear is indicated at **120** and is mounted upon sleeve **121** which is fastened onto shaft **29** to drive the latter.

The bag handling machine described herein is planned for use in conjunction with a weighing machine as a typical source of material to be placed in the bags. The weighing machine weighs out a measured quantity of material, as for example macaroni, potato chips, or other material. The open bags are filled with this material by gravity through a filling spout **125** which is positioned directly above each open bag while stationary and held by a set of fingers **34** and **36**. This spout is indicated in Figs. 11 and 12 in dot-dash lines as it is a part of the weighing machine or other material supplying apparatus.

Although not limited to use in conjunction with other machines, my present invention has a particular advantage the fact that it is designed to be one of a series of machines which mechanically transfer measured amounts of material into bags and seal the bags effecting a mechanical transfer of the bags from one machine to another. For this purpose, my bag filling and handling machine may be used in conjunction with a suitable type of bag sealing means indicated generally at **15**. The details of the particular bag sealer are not limitative upon the present invention and the sealer may be any one of a number of conventional types of devices; however, as typical of such bag sealers I show herein a portion of a bag sealer which is particularly suited to receive bags from my bag filling machine. Sealer **15** consists of a frame **130** supporting a series of pulleys **131** and **132** over which pass two parallel flexible belts **133**. Over a portion of their path, the two belts are guided by a pair of rails **135** which cause the belts to move parallel to and in engagement with each other. The initial portion of rails **135** is arcuate and conforms to a portion of the path of fingers **36**, the remainder of the rails being straight and tangent to said path. This permits a flat paper bag to be delivered to the belts as they come together around pulleys **132** and to receive this bag over that portion of the belt run which is coincident with the path of fingers **36**. After transfer, fingers **36** are withdrawn from the bag which is carried by and between the two belts to suitable sealing means, which is normally of the heat-sealing type but may be of any other type. In order to drive the sealing machine intermittently and in timed relation with the bag filling machine, ring gear **126** is mounted on the upper side of Geneva gear **27** to move therewith, shown in Figs. 2 and 8. Gear **126** meshes with pinion **127** fastened on vertically extending shaft **128** which is thus rotated intermittently and serves as a drive shaft for the sealing mechanism indicated generally at **15**.

Operation

In studying the operation of the machine, it is convenient to base the discussion on a cycle of operation equivalent to one revolution of shaft **29** as this is the common drive to which all movements can be referred. Fig. 19 is a chart showing in a qualitative or approximate manner the relative positions of or movements controlled by the several cams attached to or driven by shaft **29** during one revolution of the shaft and represents graphically much of the following description. It should be referred to frequently. At the beginning of such a cycle, the parts may be assumed to be all stationary, except for final drive shaft **29** and to occupy the positions shown in Fig. 2 except that the head at station #1 adjacent magazine **14** is raised as in Fig. 18.

It is well to start discussion with the operation of opening a paper bag at magazine **14**, as this is the first operation performed on a bag in order to prepare the bag for receiving the fingers **34** and **36** which expand and hold the bag. Assuming that plate **99** and suction cups **107** are initially in the retracted position of Fig. 2, their first movement is toward the right into engagement with the leading bag in magazine **14**. This is accomplished by rotation of cam **104** bringing the high point **104***b* of the cam into engagement with follower **103**. As the bags move forwardly down inclined bottom plate **97** of the magazine, either under gravity or by pressure of a follower, not shown, they may move too far and the action of plate **99** is not only to straighten up the bags but also to keep them in the proper position. At the same time suction cups **107** are moved forward and come into contact with the leading wall of the front bag in the magazine.

After suction cups **107** are in contact with the bag, cam section **112***a* engages roller **114** and actuates switch **111** to energize the operating solenoid of valve **110**, thus placing cups **107** in communication with the vacuum pump. The reduction of pressure in the cups causes the bag to adhere firmly to the cups. Consequently, when the cups are returned to the position of Fig. 2 by spring **102** when follower **103** returns to the dwell portion **104***a* of cam **104**, the forward wall of the bag is pulled away from the rear wall, as indicated in Fig. 2. This opens up the top of the paper bag to receive the blast of air from the nozzle above the bag. The air jet fills the bag and opens it fully. The air jet is not required on all bags but is especially helpful on some styles, especially a very long bag. The bag is now ready for insertion of fingers **34** and **36**. After these fingers are inserted in the bag and spread apart to grip the bag, as will be explained, cam **112** rotates to the point where the arm of switch **111** is released and valve **110** is closed, cutting off the connection of the suction cups to the vacuum pump. Similarly, cam **118** releases the arm of switch **117** which opens, allowing valve **115** to close and shut off the air supply to nozzle **106**. Between valve **110** and cups **107**, the line is open to the atmosphere, releasing the wall of the bag from the vacuum cups. This concludes the operations effected by cams **104**, **112** and **118**; and, as may be seen by reference to Fig. 19, the cams merely continue rotating to be restored to their starting position.

Thus one rotation of shaft **29** moves cams **104**, **118** and **112** through one complete revolution and moves the parts actuated or controlled by these cams through one complete cycle of their operation. In the same manner, the revolution of shaft **29** moves other mechanisms through one complete cycle of operation except for table **10** and the heads **12** carried thereby. There being ten operating heads on the table, gear **27** is designed to advance the table one-tenth of a revolution at each movement, that is, the table advances by a step equal to the interval between successive operating heads **12**. Thus the table and any given head go through a complete cycle of operation for every ten revolutions of drive pinion **28**.

In following the operation of table **10** and the operating heads, it is convenient to start with one head **12** in the stationary position at magazine **14** and to follow that head through a complete revolution of the table which

carries the head through a total of ten positions or stations occupied during the times that the table is stationary. This is an earlier point in the cycle than has been reached in the above description.

As the table moves into the first position (station #1 of Fig. 1) adjacent magazine **14**, roller **93** on arm **33** is riding on the lower level **92***a* of cam slot **92**. Thus the position of this roller relative to upper cam **18** is approximately that shown at **93***a* in Fig. 6. Since arm **33** is depressed about pivot **30**, the outer end of head **12** is raised, as indicated in Fig. 18, and bag fingers **34** and **36** are high enough to be above the forward bag in magazine **14**. Head **12** is in this inclined position with the fingers raised when the table stops with the head at magazine **14** at what may be considered the start of a cycle.

The next movement of the head is to the horizontal position, as shown at the right haind side of Fig. 2, inserting fingers **34** and **36** into the upper end of the leading bag of the magazine which has been opened as described above to receive the fingers. This movement of the head takes place while table **10** is stationary and results from movement of cam **18** relative to the head in a counterclockwise direction, assuming table **10** to move clockwise. Such movement of the cam is produced by rotation of cam **84** which, during about 50° of its rotation to the position of Fig. 9 from the position of Fig. 8, moves the follower on bell crank **86** outwardly away from shaft **29** (as follower **81***a* moves from **83***a* to **83***b*), rocking bell crank **86** in a cunterclockwise direction as indicated by the arrow in Fig. 9. This movement is communicated through link **80** to inner sleeve **23** to cam **18**. The angular movement of cam **18** is sufficient to shift follower **93** from the position **93***a* to the position **93***b* on cam **18**, as indicated in Fig. 6. This relative movement causes roller **93** to travel over inclined cam section **92***b* to the upper level **92***c* of the cam slot. The change in elevation of roller **93** tilts head **12** about pivot **30** and drops fingers **34** and **36** as in Figs. 2 and 13. The top line of Fig. 19 shows this downward tilting of head **12**.

With all four bag holding fingers now within the open end of the bag, the next motion is to spread only the two fingers **36** sufficiently to grip the sides of the bag at the fold in the bag. This spreading motion of fingers **36** is produced by movement of cam assembly **17** in a counterclockwise direction which moves upper ring **75** relative to cam follower **74** sufficiently to cause the follower to traverse inclined cam surface **75***a* (see Fig. 3), moving the follower from the inner portion of smaller diameter of the cam to the outer portion of larger diameter. The counterclockwise movement of cam assembly **17** is produced as a result of rotation of cam member **84** which moves the follower on bell crank **81** outwardly from shaft **29** as it passes from cam section **83***a* to section **83***b*, rocking bell crank **81** in a counterclockwise direction and shifting sleeve **21** counterclockwise, as viewed in Fig. 8. Compare Figs. 8 and 9. Fingers **36** are now spread apart into engagement with the bag, the pressure of the fingers placing the bag walls in tension and assuring an adequate frictional grip between the fingers and the bag. It should be noted that the outward movement of the fingers is limited by the size of the bag and is not determined by the extent of the outward movement of follower **74** riding on cam **75**. By virtue of the resilient connection afforded by springs **65** and **70**, fingers **63** can stop their outward movement when the bag is stretched open and before follower **74** ceases its radially outward movement.

At this time the bag occupies a position as indicated by dot-dash lines at B' in Fig. 12 with fingers **36** in the dot-dash position placing the bag walls under tension. Fingers **34** are collapsed or retracted toward each other so that the mouth of the bag is closed. This position of the fingers is maintained until after the head leaves station #1 and fingers **34** are clear of magazine **14**, when they are expanded by relative radial movement to open the bag, as indicated at B in Fig. 11.

After fingers **36** are spread to grip the bag firmly, roller **28***a* on arm **28** enters a slot **27***a* of Geneva gear **27** and table **10** is rotated one-tenth of a revolution, moving the head from station #1 to station #2. During most of the period of table movement, cam assembly **17** is stationary, as may be seen by reference to Fig. 19; and the table rotation moves lower follower **51** over cam **52** from section **52***a* to section **52***c*. In traversing inclined section **52***b*, the follower moves radially outward of the table, rotating shaft **46** and spreading fingers **34** in the manner explained above. As fingers **34** spread, fingers **36** are pulled toward each other slightly to the full line position of Fig. 11. This spreading of fingers **34** occurs during the movement of the head away from the magazine **14**, but it must not occur too early in the movement or too rapidly in order to avoid having the outer finger **34** strike the sides of the magazine.

During the terminal period of the movement of the head from station #1 to station #2 clockwise, cam **17** and **18** in that sequence also move clockwise to resume the positions occupied at the commencement of the cycle. The return counterclockwise movement of cam assembly **17**, which includes lower ring **52**, is timed to take place after or approximately at the time the fingers are fully spread; and fingers **34** are spread apart as indicated at B in Figs. 12 and 13 by the time that the head has moved into and come to rest at station #2. It will be noted that arms **36** have been moved slightly inwardly and the open upper end of the bag has now been fully opened to a generally oval shape. The bag mouth and the bag engaging fingers appear as in Fig. 20. Filling spout **125** is positioned immediately above the bag at this station in order to discharge material into the open bag and fill it.

Although I describe filling spout **125** as being located to fill the open bag while stationary at station #2, my invention is not necessarily limited to this particular position of the filling spout. If more convenient, the spout may be located at a subsequent station.

It will be apparent from the foregoing description that each revolution of the common drive shaft **29** advances any given head **12** from one station to the next successive station. Thus after a bag is filled at station #2, the table carries it successively through the several positions of stations #3, #4, #5, #6 and #7 during which the bag is held by the expanded fingers. During this portion of its travel, the only operation performed upon the filled bag is to vibrate or jar it sharply in order to tamp or pack down its contents. This is accomplished by providing cam **18** with a series of projections **138** as shown in Fig. 5. As the table advances intermittently, follower **93** rides over these projections, thus imparting to the head a sharp vertical vibration which packs down the contents of the bag. This vibratory motion may be imparted to the head during any portion of the travel between stations #2 and #7 that may be found desirable.

During the travel of the head from station #2 to station #7, cam follower **93** is riding on the upper level **92***c* of cam slot **92** in top cam **18**. Cam followers **51** and **74** controlling fingers **34** and **36** respectively are at this time riding over the relatively long circular portions **52***c* and **75***b* of cams **52** **75** respectively. As a consequence, the head is advanced at the same level and the bag gripping fingers undergo no change in position. However, during travel from station #7 to station #8 fingers **34** and **36** are disengaged and removed from the bag.

The first step in this operation is to move fingers **34** toward each other, collapsing the open end of the bag until the side walls of the bag are as close together as possible. This motion of the fingers takes place as follow-

er 51 passes over inclined section 52*d* of cam 52 (see Fig. 3) and moves on to the dwell portion 52*a* of the cam, which is the portion of smaller diameter. The bag is now held only by fingers 36 which have again moved outwardly to the dot-dash position of Fig. 12 under the force applied to these fingers by spring 65. In this collapsed position, the bag is received by and between belts 133 of sealing means 15, the belts gripping the bag just below fingers 36. As soon as the bag is firmly held by the two belts fingers 36 are moved inwardly toward each other a sufficient distance to relieve their pressure upon the bag walls. This latter movement of fingers 36 takes place as follower 74 passes over inclined section 75*c* of cam 75 to engage the circular portion of smaller diameter on the cam.

Both sets of fingers 34 and 36 are now free of any gripping engagement with the bag walls, although they are still within the mouth of the bag which is being supported entirely by the sealing means. The fingers are next removed from the bag by tilting head 12 about pivot 30. This tilting movement of the head takes place when follower 93 moves over downwardly inclined cam slot section 92*d* (Fig. 4) to the lower level 92*a* of the cam slot. This motion drops the cam follower with respect to cam 18, raising the outer end of the head and elevating the bag gripping fingers to the position of Fig. 18, as indicated at the right hand side of Fig. 2. These motions are not shown in Fig. 19 but are accomplished in the squence given during the bag travel from the position of station #7 to the position of station #8 so that when the head comes to rest at station #8 the fingers are entirely free of the bag.

To facilitate transfer of the bag from the rotating table to the moving parallel belts 133 of the sealer, it is preferable to drive belts 133 intermittently so that their movement coincides with the bag movement and they are stopped when the head is not rotating. This synchronism between the rotating table and the sealer belts is most readily accomplished by driving the sealing means from shaft 128; but the invention is in no way limited thereto.

From the position of station #8, the traveling head stops at two more stations and then is moved again into the position of station #1 where its cycle of operation is completed and a new cycle, similar to the one already described, is started. No movement of the bag engaging fingers takes place during the travel from station #8 to the starting position of station #1 so that the fingers come into this starting position in contracted positions with respect to each other and elevated above the top of the forward bag in the magazine 14.

Modified form

The machine as described so far has been designed to handle a common type of flat bag having two walls, front and back, connected directly together around three edges, as seen best in Fig. 20. Wtih certain minor modifications, the machine is easily adapted to handle an expansion type of bag B1 having a reentrant fold or bellows-type gusset along each side, as shown in Figs. 22 to 24. The modifications to the bag holding fingers are relatively simple and are of two different types, as may be seen by reference to Fig. 21.

In the first place, fingers 34*a* may be modified by extending the thin resilient plate to substantially the width of the bag. The end of each plate is preferably curved on a relatively short radius, as shown in Fig. 21, in order to prevent cutting the paper of the bag on the end of the plate when the bag is under tension.

The other modification consists of changing the mechanism for moving fingers 36*a* in such a manner that the motion of the fingers is reversed in direction from that previously described. This is done because with this type of bag, as shown in Figs. 22 and 23, fingers 36*a* engage the bag on the outside instead of on the inside as in Fig. 20. The change in motion of the fingers is accomplished without any change in mechanism except that collar 62 is rotated about 120° around shaft 46 with the result that the positions of the two arms 61 on collar 62 are shifted about 120° counterclockwise from their former positions, as may be seen in Fig. 21 by comparison with Fig. 12. As a result, a given motion of collar 62 pulls on connecting links 60 rather than pushes, or vice versa, thus moving knobs 56 and finger arms 55*a* in an angular direction opposite to that resulting from the same motion of collar 62 in the structure shown in Fig. 12. Fingers 36*a* are now moved toward each other when they were previously moved apart and vice versa.

With this modified form of apparatus, the operation is exactly the same as already described except for the change in the movement of bag holding fingers 36*a*. When the suction cups open up the top of the front bag in magazine 14, it appears somewhat as shown in Fig. 22. Fingers 34*a* are inserted in the open end of the bag while fingers 36*a* are outside the bag and in a position to engage the reentrant folds forming side walls connecting the front and back walls. With this type of bag, it is preferable that fingers 34*a* initially be spaced apart slightly, as shown in Fig. 22, that the fingers slide in against the front and back walls and do not engage the V-shaped side bellows portion. After the fingers are lowered into gripping position, fingers 36*a* move toward each other to the position of Fig. 24, pulling the bag walls tightly around plate fingers 34*a*. When fingers 34*a* are spread apart during travel of the bag from station #1 to station #2, the folded bellows at each side of the bag straightens out as shown in Figs. 21 and 23 and this outward pressure against fingers 36*a* causes them to move outwardly as the mouth of the bag is opened to assume a generally rectangular shape. After the bag has been filled and just prior to sealing, fingers 34*a* again move toward each other allowing the mouth of the bag to collapse to the position of Fig. 24; and under the force exerted by spring 65, the two fingers 36*a* move toward each other keeping the bag wall under tension at all times in order to maintain a gripping engagement with the bag. In this position, the bag is introduced between belts 133 of the sealing means and the bag gripping fingers are then disengaged and lifted out of the mouth of the bag in the manner already described.

From the foregoing description of my invention it will be evident that various changes in construction and arrangement of parts may be made by persons skilled in the art without departing from the spirit and scope of my invention. While certain of these changes have been pointed out as the description progressed, it is not intended that my invention should be limited thereto as other changes may also be made within the scope of my invention. Consequently, it is to be understood that the foregoing description is considered as being illustrative of, rather than limitative upon, the appended claims.

I claim:

1. In a bag handling mechanism, the combination comprising: a traveling bag-holding head; drive means for intermittently moving said head around a fixed axis; a pair of members movably mounted on the head and having at one end bag engaging and supporting portions; movable cam means for actuating said members to move the bag engaging and supporting portions toward and away from each other, said cam means including an annular cam mounted to oscillate about said axis; and means for moving the cam means independently of and relative to said head to actuate said members.

2. Bag handling mechanism as in claim 1 in which the drive means for moving the head and the means for moving the cam include two concentric, relatively rotatable drive members.

3. Bag handling mechanism as in claim 1 in which the members movably mounted on the head comprise

a pair of parallel arms mounted for longitudinal movement and means interconnecting the arms to effect equal and opposite linear movement of them.

4. Bag holding mechanism as in claim 1 in which the members movably mounted on the head comprise a pair of cooperating arms each pivotally mounted on the head and means connecting the arms to a common drive actuated by said cam means to effect equal and opposite pivotal movement of them.

5. In a bag handling mechanism, the combination comprising: a traveling bag-holding head; drive means for intermittently moving said head; a pair of members movably mounted on the head and having at one end bag engaging and supporting portions; pivot means mounting the head to tilt about a horizontal axis to raise and lower said bag engaging and supporting portions; a first movable cam means for actuating said members to move the bag engaging and supporting portions toward and away from each other; a second movable cam means to tilt the head about said horizontal axis; and means for moving the first and second cams independently of and in timed relation to each other and to the head.

6. Bag handling mechanism as in claim 5 in which the drive means for moving the head and the means for independently moving the two cams include three concentric, relatively rotatable drive members.

7. In a bag handling mechanism, the combination comprising: a traveling bag-holding head; means for intermittently moving said head; a plurality of bag manipulating members individually movably mounted on the head and each having at one end a bag engaging and supporting portion, said members being arranged in two pairs with the bag engaging portions of each pair of members moving apart from each other to supportingly engage the inner surface of a bag and the direction of relative movement of the bag supporting portions of one pair extending transversely to the direction of relative movement of the bag supporting portions of the other pair; movable cam means for actuating said members to move the bag engaging and supporting portions of both members of each pair toward and away from one another; and means for moving the cam means independently of and relative to said head.

8. In a bag handling mechanism, the combination comprising: a traveling bag-holding head; means for intermittently moving said head; a plurality of bag manipulating members individually movably mounted on the head and each having at one end a bag engaging and supporting portion, said members being arranged in two pairs with the bag engaging portions of each pair of members moving apart from each other to supportingly engage the inner surface of a bag and the direction of relative movement of the bag supporting portions of one pair extending transversely to the direction of relative movement of the bag supporting portions of the other pair; movable cam means for actuating said members to move the bag engaging and supporting portions of each pair toward and away from one another, said cam means including a cam assembly with a plurality of cam surfaces; means operatively connecting said bag manipulating members to the cam means including a separate cam follower engaging one of said cam surfaces for each of said pairs of members and means interconnecting the members of each pair to effect equal and opposite movement of the members of said pair; and means for moving the cam means relative to said head.

9. In a bag filling machine of the character described, the combination comprising: a stationary frame; a table rotatably mounted on the frame to turn about a vertical axis; drive means for intermittently moving the table; a plurality of bag-holding heads carried by the table and each pivotally mounted thereon to tilt about a horizontal axis; a plurality of bag engaging and supporting members carried by each head; a movable circular cam concentric with the table engaging the heads to tilt them about their axes to raise and lower the bag engaging members; and means for oscillating the circular cam about said axis in timed relation to movement of the table.

10. A bag filling machine as in claim 9 that additionally comprises a movable annular cam concentric with the table to actuate the bag engaging members for engaging and disengaging a bag; and means for oscillating the annular cam about said axis in timed relation to movement of the table.

11. In a bag filling machine of the character described, the combination comprising: a stationary frame; a table rotatably mounted on the frame to turn about a vertical axis; drive means for intermittently moving the table; a plurality of bag-holding heads carried by the table; a plurality of movable bag engaging and supporting members carried by each head; a movable annular cam concentric with the table to actuate the bag engaging members for engaging and disengaging a bag; and means for oscillating the annular cam about said axis in timed relation to movement of the table.

12. In a bag filling machine of the character described, the combination comprising: a stationary frame; a table rotatably mounted on the frame; drive means for intermittently moving the table; a plurality of bag-holding heads carried by the table; two pairs of bag engaging and supporting members mounted on each head, the members of the first pair being slidably movable substantially radially of the table and the members of the second pair being pivotally movable about spaced vertical axes; linkage for each pair of said members interconnecting the members of the pair and controlling their movement, including a lever arm and a cam follower on the lever arm; and a pair of cams each engaging one of said lever arms to shift the engaging lever arm and move the pair of bag engaging members controlled thereby independently of the other pair of members.

13. In a bag filling machine of the character described, the combination comprising: a stationary frame; a table; a plurality of bag-holding heads carried by the table and each pivotally mounted thereon to tilt about a horizontal axis; a plurality of bag supporting members carried by each head; a first cam concentric with the table engaging the heads to tilt them about their axes to raise and lower the bag engaging members; a second cam concentric with the head to actuate the bag engaging members for engaging and disengaging a bag; three concentrically disposed vertical sleeves, the table, and said two cams each being connected to the upper end of one of said sleeves; and drive means connected to the lower end of each sleeve to move the sleeve independently of the other sleeves.

14. In a bag filling machine of the character described, the combination comprising: a stationary frame; a table rotatably mounted on the frame; drive means for intermittently moving the table; a plurality of bag holding heads carried by the table and each pivotally mounted thereon to tilt about a horizontal axis; a plurality of bag engaging and supporting members carried by each head; a movable circular cam concentric with the table engaging the heads to tilt them about their axes to raise and lower the ends of the bag engaging members; a magazine holding a supply of bags in position for successive bags to be removed from the magazine by said heads; means for pulling open the mouth of a bag while in the magazine to receive the bag engaging members; drive means operating in synchronism with the table to operate the bag opening means; and drive means moving said circular cam to lower the bag engaging members into the opened bag while the table is stationary.

15. In a bag filling machine of the character described, a bag holding head comprising: a body; a pair of parallel, horizontally extending arms slidably mounted on the body and each terminating in a depending bag-supporting finger movable toward or away from the other finger; a rack-and-pinion connection between the two arms moving the arms equally and oppositely to each other; and actuating

linkage operatively connected to the rack-and-pinion connection to move said arms, the linkage including a pivotally mounted lever arm.

16. In a bag filling machine of the character described, a bag holding head comprising: a body; a pair of horizontally extending arms each terminating in a depending bag engaging and supporting finger; a pair of pivotal mounts on the body each supporting one bag engaging arm for arcuate movement about a vertical axis; each of said fingers being in substantially parallel spaced relationship with the vertical axis of the mount which carries the arm to which that finger is attached; an oscillating member; linkage connecting each pivotal mount to the oscillating member for equal and opposite angular movement of the mounts to move the fingers toward and away from each other; and actuating linkage operatively connected to said oscillating member including a lever arm.

17. The combination as in claim 16 that also includes a resilient connection between the oscillating member and the lever arm.

18. In a bag filling machine of the character described, a bag holding head comprising: a body; a first pair of arms slidably mounted on the body and each carrying a bag engaging finger; a rack-and-pinion connection between the two arms moving the arms equally and oppositely to each other; actuating linkage operatively connected to the rack-and-pinion connection to move said arms, the linkage including a pivotally mounted lever arm; a second pair of arms each carrying a bag engaging and supporting finger; a pair of pivotal mounts on the body each supporting an arm of the second pair for arcuate movement; an oscillating member; linkage connecting each pivotal mount to the oscillating member for equal and opposite movement of the mounts; and a second lever arm operatively connected to said oscillating member.

19. In a bag filling machine, the combination comprising: a stationary frame; a table mounted on the frame to rotate in a substantially horizontal plane about a vertical axis; drive means for intermittently moving the table; a plurality of movable bag engaging and supporting members; means movably mounting said members on the table for both vertical and horizontal movement relative to the table to bring the members into supporting engagement with the inner surface of a bag; actuating means carried on the frame for moving the members vertically while the table is stationary at a predetermined position; and separate actuating means carried on the frame for moving the members horizontally in timed relation to the vertical movement while the table is stationary at said position.

20. In a bag filling machine, the combination comprising: a stationary frame; a table mounted on the frame to rotate in a substantially horizontal plane about a vertical axis; drive means for intermittently moving the table; a plurality of movable bag engaging and supporting member arranged in two cooperating pairs; means mounting said members on the table for vertical movement as a unit relative to the table; means mounting one pair of members for movement radially with respect to the table; means mounting the other pair of members for movement substantially circumferentially with respect to the table; actuating means carried on the frame for effecting said vertical movement of the members while the table is stationary at a predetermined position; and separate actuating means for effecting said radial and circumferential movements of the respective pairs of members in timed relation to their vertical movement.

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