Jan. 31, 1961 H. O. IRMSCHER 2,969,628

CHARGE CONTROL MECHANISM IN INFUSION PACKAGE MANUFACTURE

Filed May 22, 1957 3 Sheets-Sheet 1

Fig. 1.

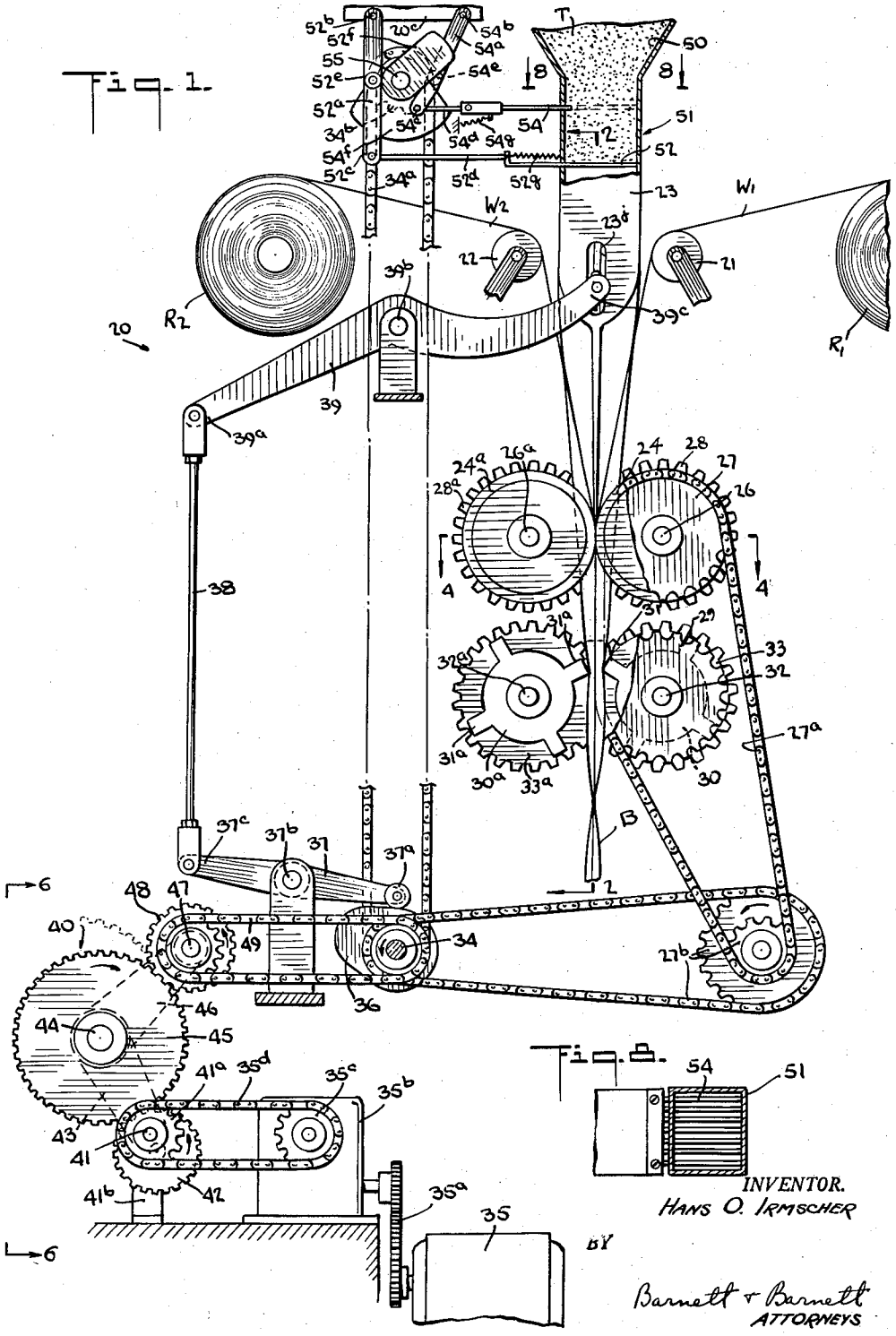

Fig. 2.

INVENTOR.
HANS O. IRMSCHER

BY

Barnett & Barnett
ATTORNEYS

Jan. 31, 1961 H. O. IRMSCHER 2,969,628

CHARGE CONTROL MECHANISM IN INFUSION PACKAGE MANUFACTURE

Filed May 22, 1957 3 Sheets-Sheet 2

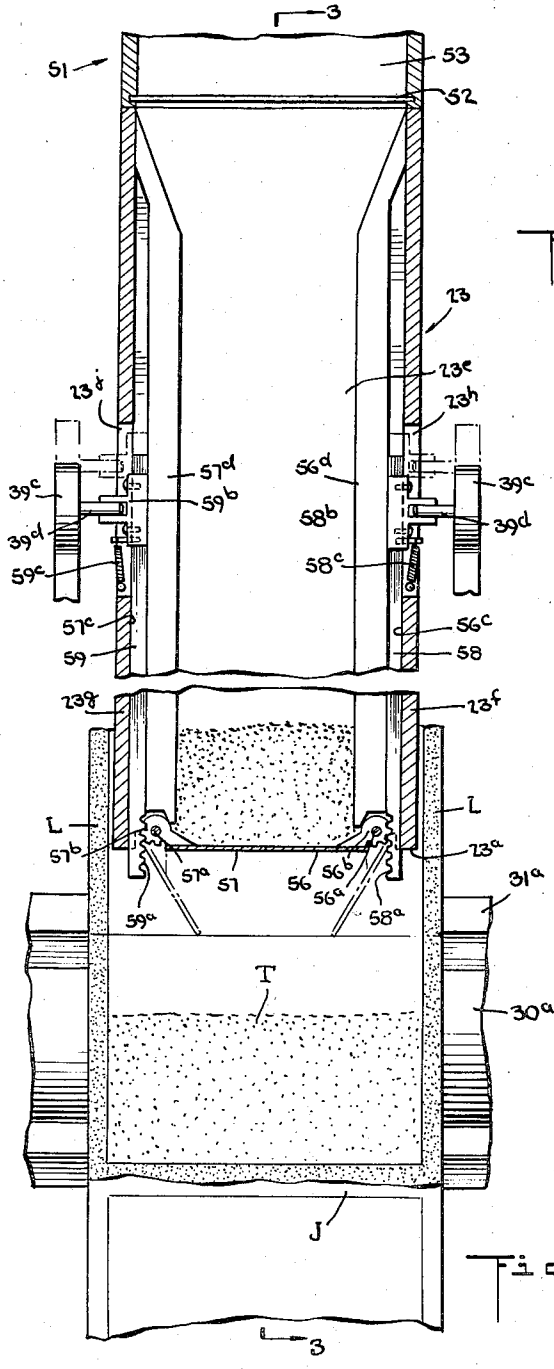

Fig. 2.

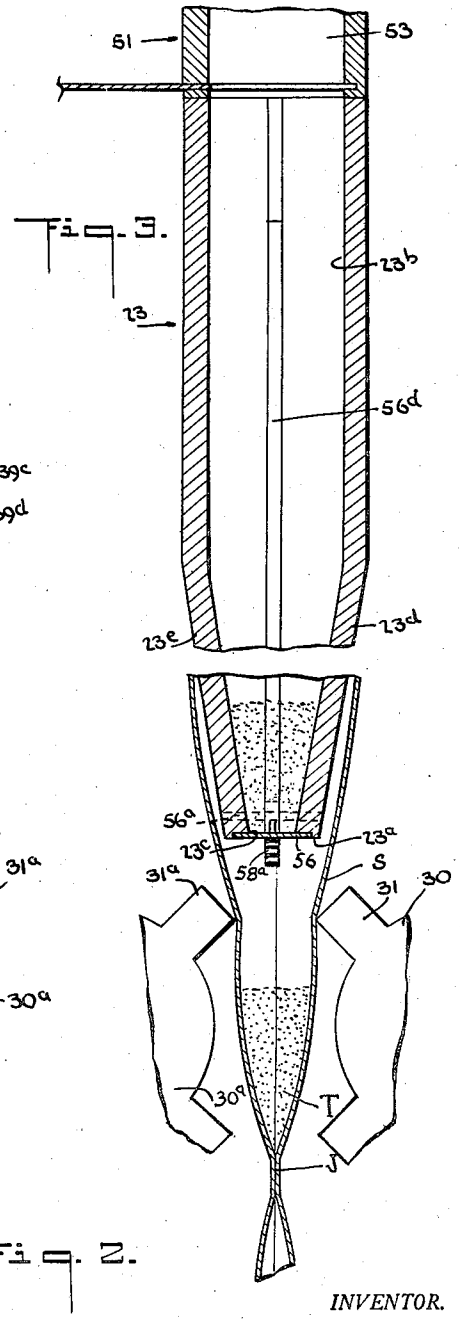

Fig. 3.

INVENTOR.
HANS O. IRMSCHER

BY

Barnett & Barnett
ATTORNEYS

Jan. 31, 1961 H. O. IRMSCHER 2,969,628

CHARGE CONTROL MECHANISM IN INFUSION PACKAGE MANUFACTURE

Filed May 22, 1957 3 Sheets-Sheet 3

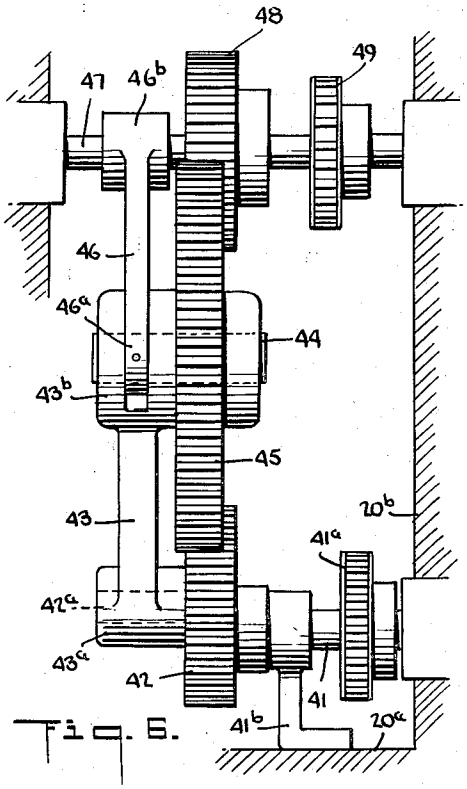

Fig. 6.

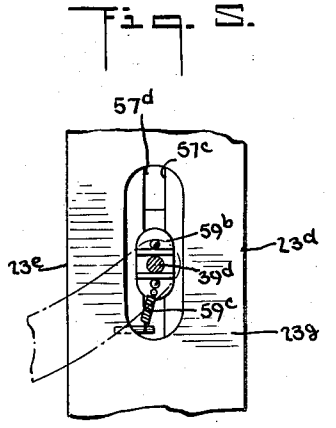

Fig. 5.

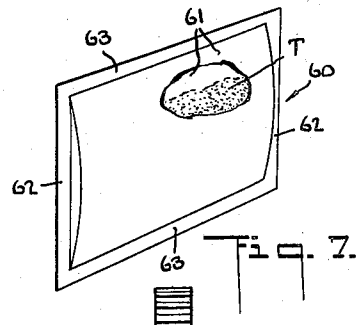

Fig. 7.

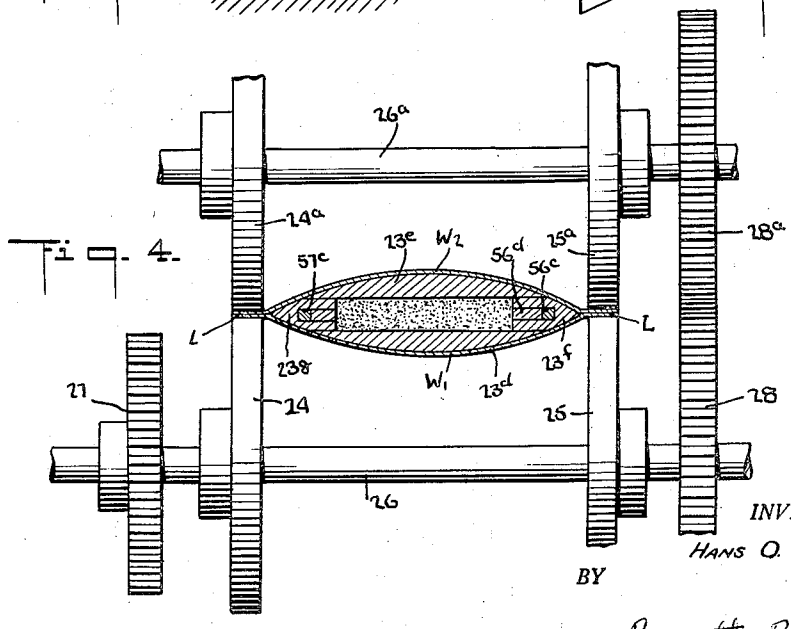

Fig. 4.

INVENTOR.
HANS O. IRMSCHER
BY
Barnett & Barnett
ATTORNEYS

United States Patent Office 2,969,628
Patented Jan. 31, 1961

2,969,628

CHARGE CONTROL MECHANISM IN INFUSION PACKAGE MANUFACTURE

Hans O. Irmscher, Hempstead, N.Y., assignor to National Tea Packing Company, Inc., Long Island City, N.Y., a corporation of New York

Filed May 22, 1957, Ser. No. 660,840

5 Claims. (Cl. 53—28)

This invention relates to the manufacture of infusion packages for food products, such as, tea, coffee, or the like, made with heat-sealing coated web strip filter sheet material and more particularly is directed to an improvement in the apparatus and method of manufacturing such packages including a charge control mechanism.

Among the objects of the invention is to generally improve the manufacture of infusion packages in providing an apparatus and method of the character described which apparatus shall comprise relatively few and simple parts that are easily assembled to provide a compact construction readily incorporated in automatic machinery, which shall deliver measured charges of a granular infusion product with reliability into the packages being formed and at the same time eliminate trapping of unsightly particles of the infusion product in the heat-sealed seams forming the package, which apparatus shall be inexpensive to construct, require a minimum of maintenance, and which shall be dependable, practical and efficient to a high degree in use.

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

The invention accordingly comprises the steps of the method and features of construction, combination of elements and arrangement of parts which shall be exemplified in the method and construction hereinafter described, the scope of the application of which will be indicated in the claims following.

In the accompanying drawing in which an illustrative embodiment of the invention is shown:

Fig. 1 is a side elevational view of an intermittently operated apparatus for manufacturing infusion packages by bringing together and heat-sealing marginal edges of two webs of filter sheet material utilizing the improved charge control mechanism embodying the invention and showing the chain drive connections for operating the elements in timed relation. With the exception of the charge measuring unit which is shown with its operating components in position during the cycle when the delivery gate is closed, all other moving parts of the apparatus are shown in their relative positions during a dwell period.

Fig. 2 is an elevational view taken through the mandrel substantially along line 2—2 in Fig. 1 showing details of the chute and charge control mechanism but with the delivery gate of the charge measuring unit also shown in dwell period position.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a sectional view taken along line 4—4 showing the heated rollers sealing the webs together along the marginal edges thereof and details of the charge control mechanism and chute within the mandrel.

Fig. 5 is an enlarged exterior view of one end wall of the mandrel showing other details of the charge control mechanism including the connection fitting between the actuating bell crank and the sliding rack for opening and closing the gate at the mouth of the chute, an end of the bell crank being indicated in broken lines and the pin

projecting therefrom and engaging the fitting being shown in section.

Fig. 6 is an enlarged rear view of the intermittent drive gearing mechanism as seen along line 6—6 in Fig. 1.

Fig. 7 is a perspective view of a filled and sealed infusion package manufactured by the apparatus embodying the invention after being severed from the tubular bag forming structure, the envelope being partly broken away to show the contents, and

Fig. 8 is a sectional view taken along line 8—8 in Fig. 1 but showing the comb of the measuring device in its closed position across the bottom of the hopper.

Referring in detail to the drawings, **20** denotes an apparatus constructed to embody the invention for manufacturing so-called pillow shaped infusion packages **60**, one of which is shown in Fig. 7 as comprising an envelope formed of two superimposed layers **61** of a heat-sealing coated filter sheet material of the type now well known in the art, for example, a high wet strength filter paper having on one side thereof a thin porous lamina of a copolymer of vinyl chloride and vinyl acetate, said layers **61** being joined together along all four edges thereof by pairs of opposite longitudinal heat-sealed seams **62** and transverse seat-sealed seams **63** and filled with an infusion product, for example, tea leaves T.

As shown in Fig. 1, said filter sheet material for forming packages **60** may be fed from two suitably positioned supply rolls R_1 and R_2 as webs W_1 and W_2, respectively, each having the heat-sealed lamina on the upfacing or outer surface thereof. Webs W_1 and W_2 on being unreeled toward each other from their respective rolls pass over idling guide rollers **21** and **22**, respectively, and then downwardly to contact opposite sides of mandrel **23**. As is clear from Fig. 4, webs W_1 and W_2 are each of a width sufficient to provide opposite longitudinal edge borders extending beyond mandrel **23** so that the heat-sealing coated surfaces thereof are brought together in face to face relation between two pairs of co-acting heated pressure rollers **24**, **24***a* and **25**, **25***a* to form opposite continuous longitudinally extending heat-sealed seams L providing an elongated tubular structure S.

Rollers **24** and **25** are mounted in spaced apart relation on shaft **26** in co-acting alignment with rollers **24***a* and **25***a* mounted on shaft **26***a*, the latter being driven from shaft **26** by suitable interconnecting gears **28** and **28***a* and turning in an opposite direction. Thus, rollers **24**, **24***a* and **25**, **25***a* also serve as an advancing means for webs W_1 and W_2 and tubular structure S formed thereby.

As tubular structure S advances beyond and below the bottom end **23***a* of mandrel **23**, it is intermittently engaged by another pair of rollers **30** and **30***a* which are provided with co-acting heat-sealing pressure elements **31** and **31***a*, respectively, for producing a transverse heat-sealed seam J. As is clear from Figs. 1 and 2, rollers **30** and **30***a* are mounted on shafts **32** and **32***a* which, like shafts **26** and **26***a*, are interconnected to turn in opposite directions by gears **33** and **33***a*.

Any suitable means may be provided for driving shafts **26**, **26***a* and **32**, **32***a* in timed relation which are here shown as driven from a common drive shaft **34** conveniently located with respect to the other elements of the machine and suitably journaled to the frame thereof (not shown). Thus, shafts **26** and **32** carry sprockets **27** and **29**, respectively, both being driven in unison by chain **27***a* which, through an intermediate speed reduction chain and sprocket drive **27***b*, interconnects with common drive shaft **34**, as shown in Fig. 1.

Apparatus **20** is designed to utilize an intermittent advancing movement for tubular structure S whereby between each dwell period a bag section B being formed by the heat-sealing of transverse seam J is filled with a

charge of tea leaves T. Any suitable means may be provided for imparting the required intermittent motion to common drive shaft 34 and, as seen in Figs. 1 and 6, an eccentric intermittent drive gearing mechanism 40 is interposed between shaft 34 and electric motor 35 serving as the power source for apparatus 20.

Eccentric intermittent drive gearing mechanism 40 is driven by electric motor 35 from a power take-off sprocket 35c provided on a reduction gear box 35b connected to electric motor 35 by a suitable chain drive 35a, sprocket 35c driving shaft 41 through chain 35d and sprocket 41a. Shaft 41 may be suitably journaled in a bracket 41b upstanding from the base 20a of apparatus 20 and a vertical frame member 20b.

Mounted on an end of shaft 41 extending beyond bracket 41b is an eccentric gear 42 mounted to rotate therewith. Eccentric gear 42 has a central stub shaft 42a to which is pivoted one end 43a of a connecting arm 43. The opposite end 43b of arm 43 is pivoted to a stub shaft 44 which mounts for free rotation thereon a large gear 45, the latter being held in constant meshing relation with eccentric gear 42 by said arm 43. An end 46a of a second arm 46 may be keyed to shaft 44 and has an opposite end 46b freely mounted on intermittently driven output shaft 47 of mechanism 40 which is driven by gear 48 mounted thereon to mesh with said large gear 45, the latter and gear 48 being retained in said meshing relation by arm 46. Said output shaft 47 may be connected to drive common drive shaft 34 by suitable means, such as, chain and sprocket 49.

Eccentric intermittent drive gearing mechanism 40, the operation of which will hereinafter be more fully described, imparts an intermittent forward motion to said common drive shaft 34 which, in addition to driving rollers 24, 24a, 25, 25a and 30, 30a in unison to effect a step by step advancement of webs W_1 and W_2, in the formation of tubular structure S and bag sections B also operates the improved charge control mechanism embodying the invention.

As seen in Fig. 1, a hopper 50 delivers a constant supply of tea leaves T into a measuring unit 51 provided at the top of mandrel 23. Any suitable measuring device may be utilized for discharging in successive timed sequence predetermined measured quantities of tea leaves T into the top of chute or hollow passageway 23b of mandrel 23. Measuring units 51 as here provided includes a sliding gate 52 and a slidable comb 54 spaced above gate 52 and positioned at the bottom of hopper 50, gate 52 and comb 54 defining a measuring compartment 53 therebetween. Lever arms 52a and 54a pivoted at ends 52b and 54b, respectively, to a frame portion 20c connect at opposite ends 52c and 54c through linkages 52d and 54d with gate 52 and comb 54, respectively, and mount cam followers 52e and 54e which ride on cams 52f and 54f of cam shaft 55. The latter is driven in proper intermittent timed relation from common drive shaft 34 through a drive chain 34a and sprocket 34b to reciprocate said gate 52 and comb 54 in the operation of measuring unit 51.

Gate 52 is releasably urged into a normally closed position by spring 52g which also serves to retain cam follower 52e against the surface of cam 52f while comb 54 is releasably urged into a normally open position by spring 54g which also retains cam follower 54e against cam 54f.

In order to effect positive control of the tea leaves T being delivered into each bag section B subsequent to being formed by the heat-sealing of transverse seam J, a charge control mechanism embodying the invention is provided which includes another gate at the bottom end 23a of mandrel 23. The charge control mechanism is shown in Figs. 2 and 3 to include a pair of swingable gate members 56 and 57 hinged at opposite ends on laterally extending pintles 56a and 57a to extend across said bottom mandrel end 23a and meeting in the center to close off the opening or mouth 23c of chute 23b, opposite sides at the lower portion of mandrel 23 being tapered downwardly as at 23d and 23e forming the lower portion of said chute 23b into an elongated rectangular cross section and said mouth 23c into a slit-like opening.

The hinged ends of gate members 56 and 57 have toothed sectors 56b and 57b engaging teeth 58a and 59a formed at the lower ends of vertically extending racks 58 and 59 mounted for reciprocating movement in vertical grooves or tracks 56c and 57c formed in opposite end walls 23f and 23g, respectively, of mandrel 23. Tracks 56c and 57c may also be fitted with closure strips 56d and 57d, respectively, for sealing reciprocating racks 58 and 59 from tea leaves and tea dust passing through chute 23b and for presenting a smooth interior surface for the latter.

Reciprocating movement in proper timing is imparted to racks 58 and 59 from common drive shaft 34 by a pair of cams 36 engaging cam followers 37a of lever arms 37. The latter, also provided in a pair, each being pivoted at 37b, actuate bell cranks 39 through vertical push rods 38 extending between lever arm ends 37c and bell crank ends 39a. Bell cranks 39 pivoted at 39b carry at ends 39c laterally projecting pins 39d which engage fittings 58b and 59b mounted on the upper ends of racks 58 and 59, fittings 58b and 59b extending through exterior slots 23h and 23j in opposite end walls 23f and 23g, respectively. Tension springs 58c and 59c extending between fittings 58b and 59b and end walls 23f and 23g, respectively, serve to urge racks 58 and 59 into the lowered position shown in full lines in Fig. 2 serving to maintain gate members 56 and 57 in a normally closed position.

From the above description and drawings, the operation of apparatus 20 for forming and filling infusion packages 60 will now be readily understood.

Apparatus 20 is shown in Figs. 2 and 3 with all parts at rest during a dwell period in the intermittent cycle of operation. Thus, webs W_1 and W_2 are at rest in their step by step advancing motion from respective supply rolls R_1 and R_2 passing over idling guide rollers 21 and 22 and down along opposite sides 23d and 23e of mandrel 23 between heated pressure rollers 24, 24a and 25, 25a. The advance section of webs W_1 and W_2 which have passed between said rollers 24, 24a and 25, 25a have been formed into tubular structure S which extends beyond and below the bottom end 23a of mandrel 23 and then between rollers 30 and 30a. Tubular structure S extending below said rollers 30 and 30a has been formed with transverse heat-sealed seams J into a partially finished bag section and filled with a charge of tea leaves T. Below the partially formed but filled bag section are a series of closed bag sections B which are subsequently severed from structure S and delivered to a conveyor for packing in the well understood manner. During the dwell period, one pair of heat-sealing pressure elements 31 and 31a of rollers 30 and 30a, respectively, have come to rest in the position shown in Figs. 1 and 3.

Rollers 24, 24a, 25, 25a and 30, 30a are constructed and arranged to be rotated one quarter revolution between dwell periods, heat-sealing pressure elements 31 and 31a being provided at 90° intervals around the surface of rollers 30 and 30a, respectively, to effect the heat-sealing of one transverse seam J during the operating cycle between each dwell period. While apparatus 20 is at rest, gate members 56 and 57 at the bottom end 23a of mandrel 23 are in a closed position preventing any particles of tea or tea dust passing from mandrel 23. Also during the dwell period, cams 52f and 54f have come to rest in a position for retaining gate 52 in open position and comb 54 in closed position shown in Fig. 8 so that compartment 53 will empty its measured charge into chute 23b for collection above closed gate members 56 and 57.

The dwell period in the operation of apparatus **20** occurs when eccentric gear **42** of intermittent drive gearing mechanism **40** is in the position shown in Fig. 1, that is, when its center lies in a plane intersecting shafts **41** and **44** but on the side of shaft **41** opposite shaft **44**. As eccentric gear **42** rotates counterclockwise as seen in Fig. 1, large gear **45** is caused to drive gear **48** at an accelerating speed for the first half of a revolution of the latter, that is, until the center of eccentric gear **42** again lies in said intersecting plane but between shafts **41** and **44**. At this point, large gear **44** will be in the position shown in broken lines in Fig. 1 and will be driving gear **48** at its maximum speed. Thereafter, during the second half of the revolution of gear **48**, deceleration occurs until at the end of the revolution gear **48** is stationary to provide the relatively short dwell period. Thus, common drive shaft **34**, driven from shaft **47** through chain **49** synchronously with gear **48**, also completes one revolution between dwell periods. Thus, intermittent drive gearing mechanism **40** not only provides the dwell periods, but also the varying, that is, pulsating rate of speed between dwells which enables apparatus **20** to operate smoothly, eliminating abrupt stops and starts which ordinarily contribute to excessive wear and high maintenance costs.

At the end of each dwell period, as common drive shaft **34** commences its rotation in a counterclockwise direction, as seen from Fig. 1, rollers **24**, **24***a*, **25**, **25***a* and **30**, **30***a* are driven to advance webs W_1 and W_2. Early in the cycle, as rollers **30**, **30***a* begin to rotate, the pair of heat-sealing pressure elements **31** and **31***a* shown in Figs. 1 and 2 extending at about a 45° angle from the horizontal will be brought together to form transverse seam J which seals the top transverse seam of the preceding bag B and forms the bottom transverse seam of a succeeding bag, in the well understood manner.

While this is taking place, cam **52***f* is rotated by shaft **55** to permit lever arm **52***a* urged by spring **52***g* to return to a normally closed position, shortly after which cam **54***f* releases lever arm **54***a* permitting spring **54***g* to withdraw comb **54** from the position shown in Fig. 8 to its normally open position shown in Fig. 1. The charge of tea T which has been delivered into chute **23***b* at the end of the previous cycle and has collected behind charge control gate members **56** and **57** as shown in Figs. 2 and 3 in the transferred into the partially formed bag section. This transfer is accomplished in proper timed relation after the completion of transverse seam J by cams **36** mounted on common drive shaft **34** and operating bell cranks **39** to raise racks **58** and **59** from the full line position to the broken line position shown in Fig. 2, racks **58** and **59** rotating toothed sectors **56***b* and **57***b* to swing gate members **56** and **57** to the open position shown in broken lines in Fig. 2.

When the cycle ends, gate members **56** and **57** are again in closed position to seal off chute **23***b*. The dwell period has been found to render satisfactory results in the manufacture of packages **60** by giving any tea particles and dust, which may be floating within the bag section after the bulk of the charge has been delivered, a chance to settle, thereby eliminating the trapping of such particles and dust in heat-sealed seams J, the latter becoming transverse seams **63** when finished bag sections B are severed from each other to form packages **60** shown in Fig. 7.

The improved method embodying the invention will be seen to comprise the steps of forming tubular structure S about mandrel **23** through which a delivery chute **23***b* extends while intermittently being advanced downwardly beyond mandrel bottom end **23***a* where a transverse heat-sealed seam J is applied thereto by pressure elements **31** and **31***a* to form a bag section, transferring a charge of tea T, previously measured and collected at the mouth of mandrel **23***c* behind closed transfer gate members **56** and **57**, into the bag section while the latter continues its advancing movement, sealing off mouth **23***c* of mandrel **23** by closing gate members **56** and **57** while measuring and depositing a charge of tea T into the top of chute **23***b* and thereafter stopping the advancing movement of said tubular structure S and filled bag section prior to applying the next heat-sealed seam J forming a top closure for the preceding bag and a bottom closure for the succeeding bag, the dwell period serving to permit particles and dust within the bag section accompanying the charge to settle thereby eliminating the trapping of such particles in heat-sealed seam J and ensuring a desirable appearance of the bag.

Apparatus **20** and the method of manufacture embodying the invention has been found to give desired satisfactory results where prior devices and methods have been unsuccessful in forming packages **60** which are designed to be more than half filled with tea leaves T, as shown in Fig. 7.

Mandrel **23** and allied parts may be duplicated for multiple production of tea bags **60** and simultaneously operated from a single common drive shaft **34** and intermittent drive gearing mechanism **40** in the well understood manner.

It will thus be seen that there is provided an improved method and apparatus for infusion package manufacture in which the several objects of the invention are achieved and which are well adapted to meet the conditions of practical use.

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

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

1. The method of manufacturing infusion packages containing a fluid commodity comprising the steps of forming a tubular structure about a vertically disposed mandrel having a delivery chute extending therethrough, intermittently advancing said tubular structure downwardly beyond the end of the mandrel and heat-sealing a transverse seam across said structure to form a bag section, transferring a previously measured and collected charge of said fluid commodity from the lower end of the delivery chute into said bag section while the latter continues to advance, sealing off the mouth of the chute to prevent further entrance of the fluid commodity into the bag section, delivering a measured charge into the top of the chute for filling the succeeding bag, stopping for a dwell period said advancing movement of the tubular structure and filled bag section while the mouth of the chute remains sealed to permit the charge within the bag section being formed to settle before applying the next transverse seam to form a top closure for the filled bag section and a bottom closure for the succeeding bag section, said intermittent advancing movement of said tubular structure for heat-sealing and filling between said dwell periods being accomplished at a pulsating rate of speed.

2. In an apparatus for forming and filling packages with a fluent material content, a substantially vertical mandrel having pairs of opposite end and side walls defining a hollow delivery chute, said chute tapering from a wider cross-sectional area at the top to a narrower cross-sectional area at the bottom, the interior surfaces of said side and end walls being otherwise free from obstruction, a fluent material hopper at the top of said chute, a measuring device interposed between the hopper and chute for delivering measured charges of said fluent material from the hopper into the chute, a pair of gate members, each hinged to a bottom portion of an end wall of said chute for swinging movement from a closed horizontal position in free end abutment with the other member across

a mouth of said chute to a downwardly extending open position, a slidable rack mounted within each of said end walls operatively connected to one of the gate members for opening and closing the latter, and power drive means operating said measuring device and said racks in predetermined timed relation.

3. An apparatus for forming and filling packages with a fluent material content comprising a substantially vertical mandrel through which a delivery chute extends, means for forming and downwardly advancing a heat-sealed tubular structure from strip sheet material about said mandrel, heat-sealing means below said mandrel for applying spaced transverse seams across said tubular structure forming bag sections therebetween, a fluent material hopper at the top of said chute, a measuring compartment interposed between the hopper and chute defined by an upper horizontally slidable comb and a lower horizontally slidable gate, a pair of gate members, each hinged to a bottom portion of said mandrel for swinging movement from a closed horizontal position in free end abutment with the other member across a mouth of the chute to a downwardly extending open position, a common drive shaft, means for intermittently driving said common drive shaft through successive single revolution strokes between dwells and at a varying speed reaching a maximum midway each stroke, cam means operating said slidable comb, slidable gate and hinged gate members from said common drive shaft to open and close in timed relation, and drive means interconnecting the common drive shaft with said forming and advancing means and said transverse seam heat-sealing means to operate in timed relation with said comb, gate and gate members in forming and filling said bag sections.

4. The apparatus defined in claim 3 in which said cam means, interconnecting drive means and common drive shaft are arranged to provide the between cycle dwell period after said gate members close and before the transverse heat-sealing means operates to close the filled bag section being formed.

5. In an apparatus for forming and filling packages with a fluent material content, a substantially vertical mandrel having pairs of opposite end and side walls defining a hollow delivery chute, said chute tapering from a wider cross-sectional area at the top to a narrower cross-sectional area at the bottom, the interior surfaces of said side and end walls being otherwise free from obstruction, a fluent material hopper at the top of said chute, a measuring compartment interposed between the hopper and chute defined by an upper horizontally slidable comb and a lower horizontally slidable gate, a pair of gate members, each hinged to a bottom portion of an end wall of said chute for swinging movement from a closed horizontal position in free end abutment with the other member across a mouth of said chute to a downwardly extending open position, a slidable rack mounted within each of said end walls operatively connected to one of the gate members for opening and closing the latter, and power means operating said slidable comb, slidable gate and pair of gate members to close said comb and said pair of gate members while the slidable gate is open.

References Cited in the file of this patent

UNITED STATES PATENTS

2,070,152	Bennett	Feb. 9, 1937
2,113,636	Vogt	Apr. 12, 1938
2,482,593	Palmer	Sept. 20, 1949