United States Patent

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[31] **6995/69**

[54] **PACKAGING MACHINE**
8 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **53/51,** 53/178, 53/180, 222/414
[51] **Int. Cl.** **B65b 9/12,** G01f 11/24
[50] **Field of Search** 53/28, 180, 182, 51, 178; 222/410, 414, 427; 141/10, 67, 68

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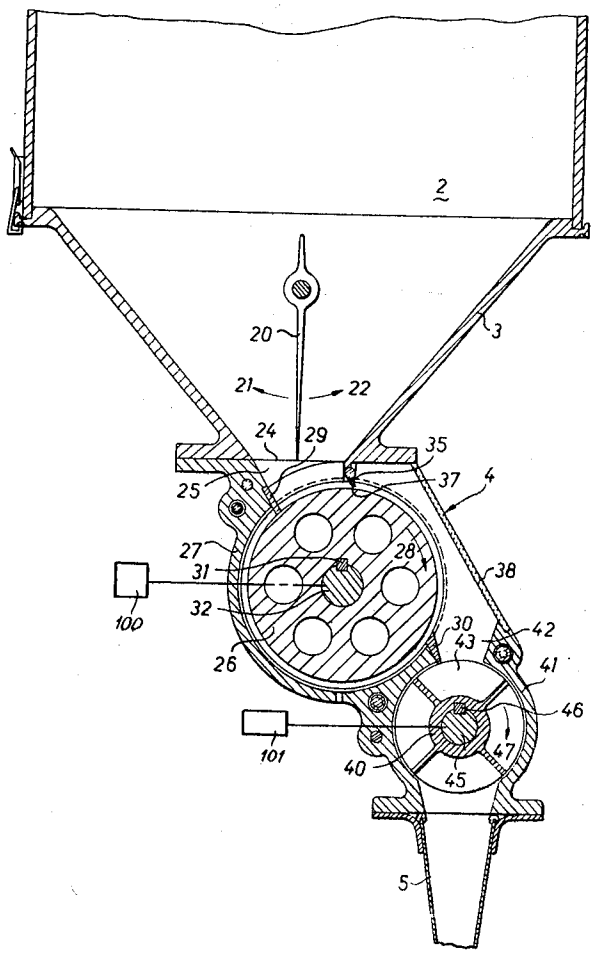
ABSTRACT: A packaging machine for the fabrication, filling and closing at all sides of sealed flat packages formed of heat-sealable material and for packaging granulate, fibrous, or foliated pourable material, comprising an infeed container for the material to be packaged, a quantity-dosing device, a sealing station for forming the packages from at least one continuously infed band and a cutting station for cutting the interconnected or coherent band which is equipped with sealing seams. According to the invention the dosing device embodies a predosing mechanism equipped with an adjustable vane for regulating the pouring height of the material upon a dosing wheel having an infinite drive. Arranged after the dosing wheel is a vane or impeller wheel driven by an indexing mechanism and equipped with a horizontal shaft, this impeller wheel serving as a portioning dosing device. Further, in order to manufacture the packages at the sealing station composed of two heatable sealing rollers, there is introduced from two sides a respective band member which is scanned by photocell means and which are regulated to travel in synchronism with one another by adjustment or control means.



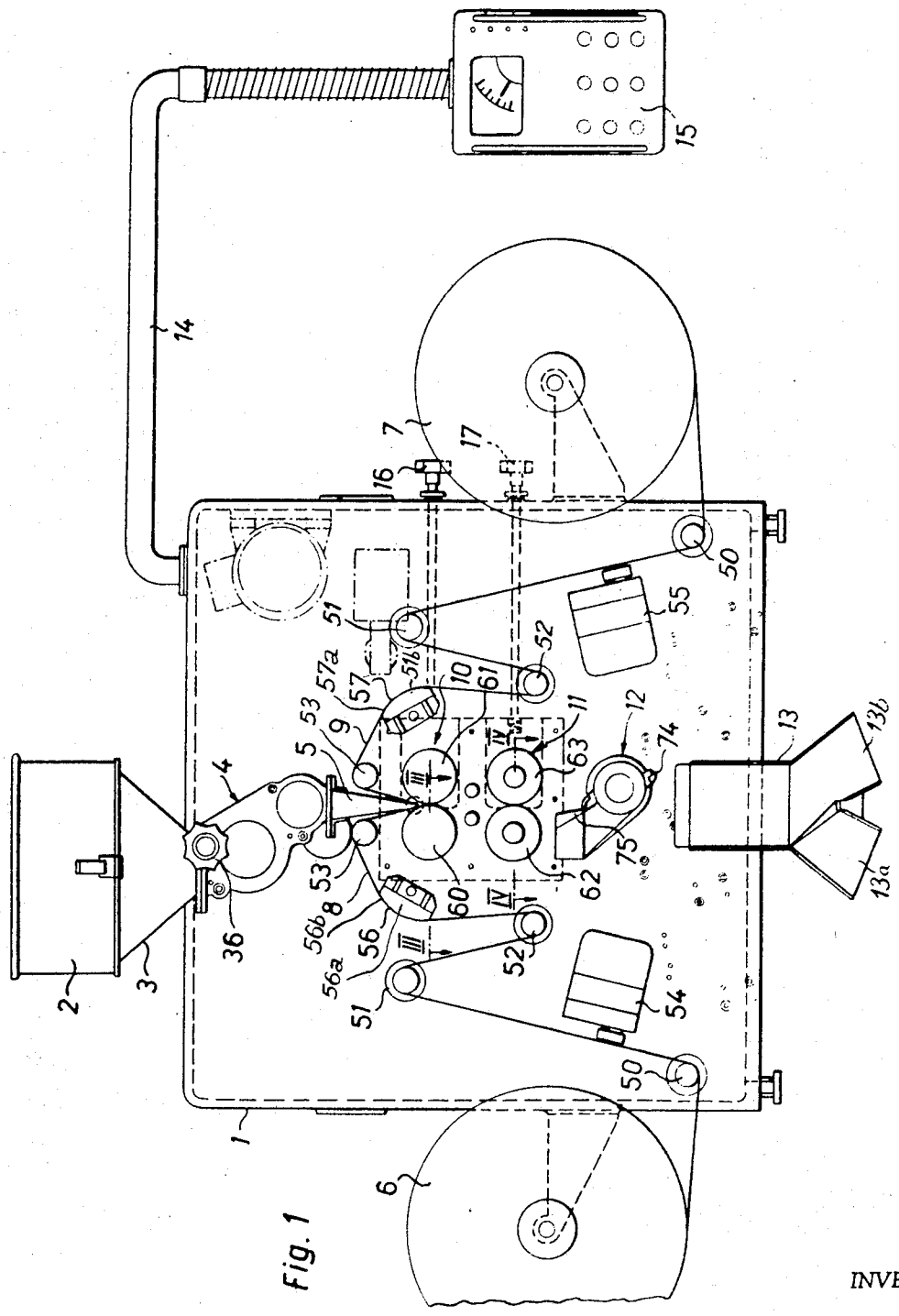


Fig. 1

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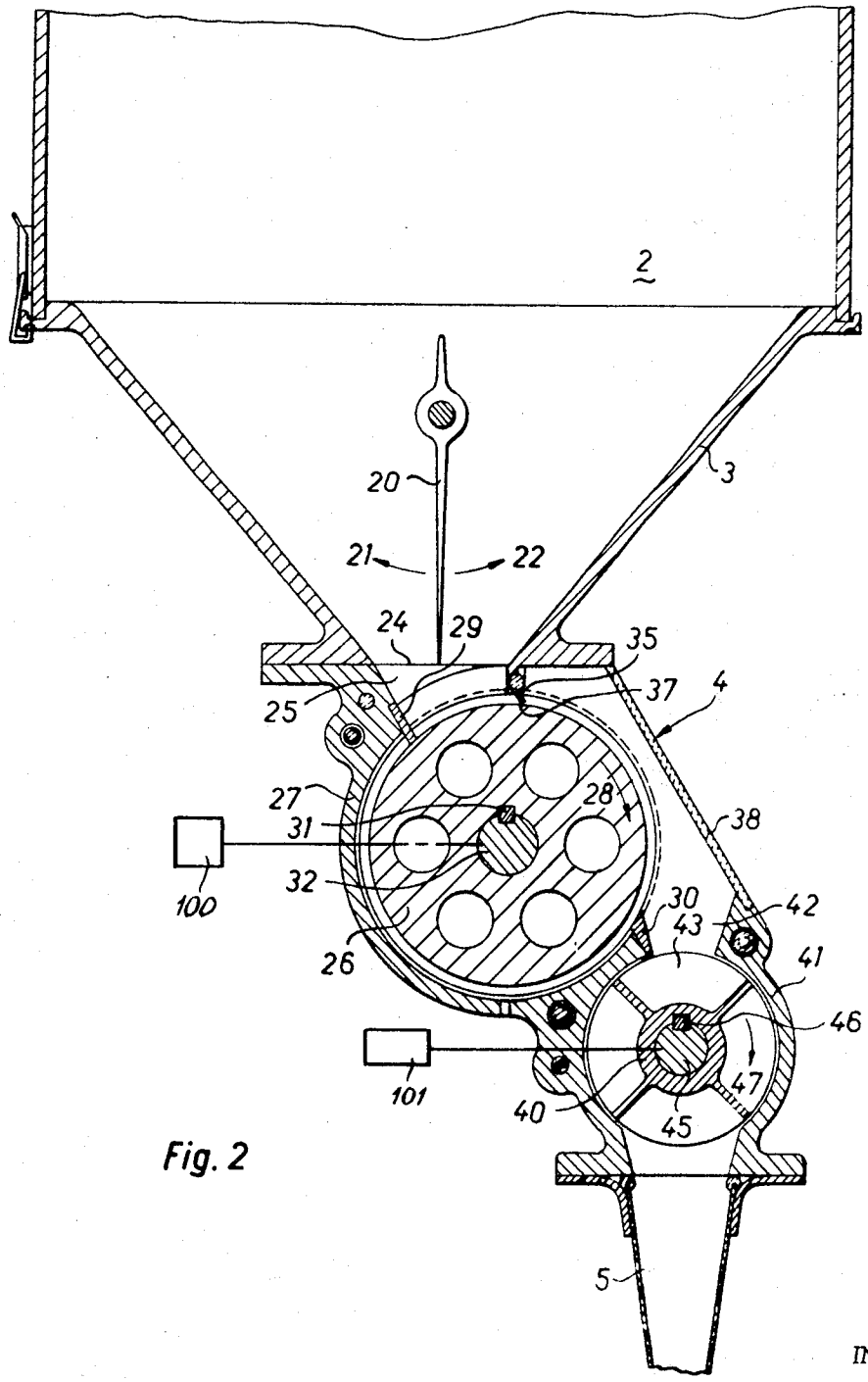

Fig. 2

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Fig. 4

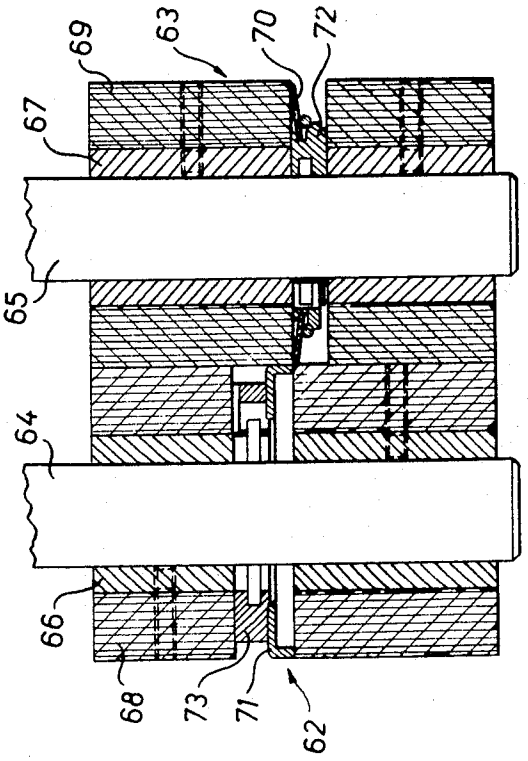
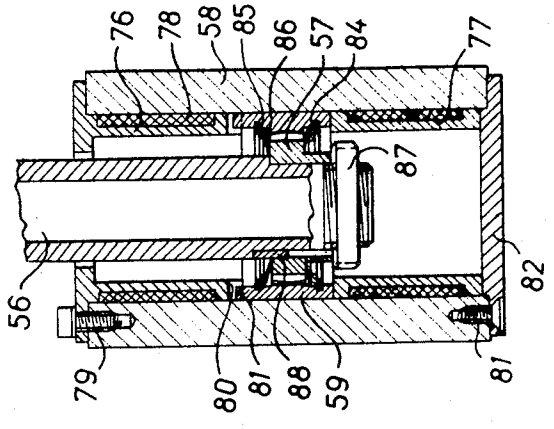


Fig. 3



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PACKAGING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved packing machine for the production, filling, and closing at all sides of sealed flat packages formed of a heat-sealable material and serves for the packaging of granulate and fibrous or foliated pourable materials. The inventive packaging machine broadly is of the type comprising an infeed container, a quantity-dosing device as well as a sealing station for the formation of the packages from a continuous band, and further includes a cutting station for cutting the coherent band equipped with the sealing seams.

Packaging equipment is already known to the art which fulfills the aforementioned functions. Feeding of this equipment with the material to be packaged is undertaken from a filling container through the agency of a disk dosing device operating according to the volumetric principle and having a horizontally arranged dosing disk, with the dosing operation of this device being adjustable. Two sealing rolls draw off the package material from a supply roller, the material then traveling over a folding shoulder at that location being folded to possess a substantially V-shaped configuration. After the sealing operation, which, if desired, can occur while providing for the bag or package a string and a label, the finished packages are severe by a rotating knife having a vertical axis of rotation, whereupon they fall onto a chute having a two exits and are thereafter automatically counted by a suitable counting mechanism.

Although this machine has proven itself in practical operation, certain limitations are imposed thereon with regard to the number of packages which are to be filled because of the particular construction of such type equipment. One reason for these limitations with this type equipment is that the dosing disk cannot be rotated at any optionally quick speed since otherwise the material to be filled, especially fibrous and foliated material which requires an especially protective handling, would at least be partially destroyed or comminuted. Also, by virtue of the V-shaped folding of the package band a certain speed limit cannot be exceeded.

SUMMARY OF THE INVENTION

Therefore, a real need exists in the art for a packaging machine which effectively overcomes the aforementioned drawbacks of the prior art constructions. It is one primary object of the present invention to provide just such a new and improved packaging machine which effectively fulfills this need and overcomes the aforementioned drawbacks of the prior art constructions.

Another, more specific object of the present invention relates to an improved packaging machine which considerably exceeds the inherent limitations which were otherwise present with such type of prior art equipment and, further, ensures for an extremely protective handling of the material to be filled.

Still a further significant object of the present invention relates to an improved packaging machine of the mentioned type which is relatively simple in construction, extremely reliable in operation, not readily subject to breakdown, provides for extensive protective handling of the material to be packaged, enables increased production speeds without damage to the material, affords a compact construction of equipment which results in saving of space, and wherein the operation of the machinery itself is not complicated and can be therefore serviced much more economically and quicker.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the inventive packaging machine of the aforementioned type is manifested by the features that the quantity-dosing device embodies at least one predosing mechanism and a continuously operating fine-dosing mechanism, wherein a portion dosing mechanism is arranged after both the predosing mechanism and the fine-dosing mechanism.

The invention advantageously contemplates equipping the predosing mechanism with a pivotable vane or blade for adjusting the pour height of the material onto a fine-dosing impeller or wheel equipped with an infinitely variable drive mechanism. The fine-dosing wheel or impeller empties the material to be filled into an impeller wheel for forming the material portions, this impeller wheel being driven by a suitable indexing mechanism. Furthermore, the vane forming the predosing mechanism is advantageously arranged at the region of the apex or crown of the fine dosing wheel and the feed side of an infeed container or the like, the latter of which—viewed in the rotation direction of the fine-dosing wheel—terminates in front of the apex of the fine-dosing wheel and is sealed towards the discharge side of the fine-dosing wheel by means of a gate or closure.

Apart from the foregoing, the production of the packages at the sealing station consisting of two heatable sealing rollers advantageously is undertaken with the aid of two bands or foils which are symmetrically infed with respect to the direction of movement of the package and are mutually positionally controlled by photocells.

According to a further aspect of the inventive concepts, a partial sealing of the bands or foils occurs prior to reception of the material to be filled, whereby an infeed funnel arranged between both bands spreads these partially sealed bands and thus forms a hollow compartment for receiving the material to be packaged. Furthermore, the adjustment or control means for the positional control of the bands or foils can be constituted by an apertured plate member which is subjected to negative pressure.

Apart from these features, the cutting station can consist of a pair of rollers which exhibit a circular knife or cutter for the longitudinal cutting of the bands, as well as a rotating transverse cutting roller having at least one longitudinal knife or cutter element extending at an inclination to the axis of rotation.

Even further, and according to an additional manifestation of the invention, the predosing mechanism and the fine-dosing wheel, the band or bands, the sealing roller and the cutting rollers, can all each possess such a width that it is possible to simultaneously manufacture two packages or bags.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above will become apparent, when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1 is a front schematic view of a preferred embodiment of inventive packaging machine or equipment for the production, filling and closing of sealed flat packages or bags at all sides;

FIG. 2 is a vertical sectional view, on an enlarged scale, through the dosing mechanism employed in the packaging equipment of FIG. 1;

FIG. 3 is a horizontal sectional view through one of the sealing rollers employed in the equipment of FIG. 1, taken along the line III—III thereof; and

FIG. 4 is a horizontal sectional view through a lengthwise cutting-roller pair of the cutting station employed in the packaging equipment of FIG. 1, taken along the line IV—IV thereof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 there is schematically depicted a front view of a preferred embodiment of inventive packaging machinery or equipment provided with a housing 1. At the front face of the housing 1 there are arranged, viewed from the top towards the bottom, the following devices: Uppermost there is located the infeed container 2 with an infeed portion or funnel 3 at which there is connected a dosing mechanism, designated in its entirety by reference numeral 4. An infeed funnel 5 is arranged

at the discharge side of the dosing mechanism **4**, funnel **5** extending between two bands or foils **8** and **9** withdrawn from the supply rollers **6** and **7**, this infeed funnel **5** reaching up to the region of the sealing station **10**.

The sealing and filling of the packages occurs at this sealing station **10** which are then delivered in the form of a sealed band subsequently to a lengthwise cutting mechanism **11** and thereafter to a transverse cutting mechanism **12**. The finished packages or bags next drop onto a chute or slide **13** having two outlets, at which location they are for instance counted by means of any suitable preselection counter to a predetermined number of packages and are then alternately ejected via the right and left discharge portion or outlet of the aforementioned chute **13**.

Located internally of the housing **1** are all of the devices or mechanisms necessary for driving the previously mentioned components, together with the associated regulation and control means. A switching or control panel **15** is suspended at the housing **1** with the aid of a rotatable arm **14**, so that the packaging machine can be properly controlled from any desired location. Setting or adjustment knobs **16** and **17**, or equivalent structure, serve for the adjustment or setting of the machine.

Now by referring more particularly to FIG. **2**, there will next be explained in detail the structure and operation of the so-called quantity-dosing mechanism **4**. The infeed portion of funnel **3** of the infeed container **2** will be seen to be equipped with a vibrating or oscillating vane **20** which can carry out rocking or pivotal movements in the direction of the arrows **21** and **22** through the action of any suitable nonillustrated drive means or the like. Due to the oscillatory motion imparted to the vane or blade **20**, there is effectively prevented the formation of clumps or bridges by the material to be packaged and there is ensured a uniform feed of the material to be packaged into this dosing mechanism **4**.

The lower end of the infeed portion **3** possesses an opening **24** which merges with an infeed opening **25** provided at a housing **27** encasing a fine-dosing wheel or impeller **26**. The fine-dosing wheel **26** is snugly seated within the housing **27** in order to maintain any possible material losses as small as can be. Further, this fine-dosing wheel **26** has a roughened surface extending along its peripheral region which improves the entrainment of the material to be filled. Roughening of this peripheral surface can be, for instance, effected by providing teeth which are conventional through the formation of serrations. Fine-dosing Wheel or impeller **26** rotates, in this instance, in the direction of the arrow **28** and possesses a gate or closure **29** at the region of the infeed opening **25** in order to prevent losses of fillable material, this gate **29** being situated approximately diametrically opposite a further gate or closure **30**. Furthermore, the fine-dosing wheel or impeller **26** is fixedly seated upon a shaft **32** through the agency of a key or wedge **31**, shaft **32** being mounted in the housing **1** and driven therefrom, specifically by means of the schematically depicted infinitely variable adjustable drive means **100**. It is important that driving of the fine-dosing wheel **26** be undertaken by means of an infinitely variable adjustable drive mechanism or means **100**, the adjustment of which can occur independently of the drive for the remaining components of the equipment.

Continuing, it will be recognized that approximately above the crown or apex of the fine-dosing wheel **26** there is arranged the predosing mechanism which is shown to consist of a pivotable vane or blade **35** likewise mounted in the housing **26**. Vane **35** can be adjusted by means of the adjusting knob **36**, best shown in FIG. **1**, and thus together with the peripheral surface of the fine-dosing wheel **26** forms a dosing gap or space **37**. Adjustment of this gap **37** only provides a coarse adjustment of the dosing of the material to e filled, whereas the fine dosing is undertaken by regulating the rotational speed of the fine-dosing wheel or impeller **26**. Through both of these means, the predosing vane **35** and the fine-dosing wheel **26**, there is provided the possibility of regulating extremely exactly the dosing of the fillable material with the most protective processing thereof.

The circumferential region or outer surface of the fine-dosing wheel **22** which supports the fillable material can be observed by removing a cover member **38**. This cover member **38** can also advantageously be formed of transparent material, to thereby permit inspection and observation of the fine-dosing wheel **26** without necessitating removal of such cover member.

Arranged at a small distance below the fine-dosing wheel **26** is the impeller or vane wheel **40** having a horizontal axle or shaft **45**. Furthermore, the housing **41** enclosing the impeller wheel **40** possesses an opening **42** through which the fillable material arrives at the individual compartment or pockets **43** of the impeller wheel **40**. Impeller wheel **40**. Impeller wheel **40** is fixedly secured to the shaft **45** by a key **46** or equivalent structure. Further, this impeller wheel **40** is driven in the direction of the arrow **47** through the agency of a suitable indexing mechanism, for instance a Maltese cross or Geneva indexing mechanism, schematically shown at **101** in FIG. **2**, and arranged in the housing **1**. It should be understood that the impeller wheel **40** does not actually carry out any dosing function as such because of the previously arranged predosing mechanism **35** and the fine-dosing wheel **26**. Rather, it performs the function of dividing the continuous stream of fillable material flowing from the fine-dosing wheel **26** into portions, and to empty the fillable material portions into infeed funnel **5**. Depending upon the dosing of material which is regulated, the pockets or compartments **43** of the impeller wheel **40** are filled to a greater or lesser extent. The dosing operation or the distribution of the stream of fillable material into portions therefore also occurs in an extremely protective manner.

As already previously explained heretofore, in order to form the bags or packages there are employed two foils or bands **8** and **9** which are delivered to a sealing station **10**. More precisely, the band **8** is drawn off of the associated supply roll **6** and is delivered over the rollers **50**, **51**, **52**, and **53**, before it arrives at the sealing station **10**. A similar arrangement of rollers **50**, **51**, **52**, and **53** is provided for the other band or foil **9** which is received from the supply roll **7**. Now for each of the bands **8** and **9** there is arranged a respective photocell **54** and **55** between the associated rolls **50** and **51**, as shown, photocells **54** and **55** serving to scan alignment marks or the like provided at the associated bands **8** and **9** respectively. The generated signals ore compared in a suitable control device accommodated in the housing **1** and, in the event that there is a failure of coincidence between these alignment marks at the respective bands, then such can be corrected by changing the speed of one band. This speed correction of the motion of the bands can be carried out be means of the associated control heads **56** and **57** providing a chamber **56*a*** and **57*a***, respectively, covered by an associated apertured plate member **56*b*** and **57*b*** respectively. The control head unit can be switched in or switched out with a suitable vacuum network through the agency of appropriate switching valves, the presence of a controlled vacuum in each control head **56** and **57** thereby providing speed regulation for the associated band traveling thereover. The aforementioned mechanism for regulating the synchronism of travel of both bands **8** and **9** used for the production of the packages is sensitive and permits of a very rapid correction of any deviations.

Considering now the construction of the sealing station **10**, it will be understood that such consists of two rollers **60** and **61** which are heated by means of any appropriate electrical heating device to the temperature necessary for heat sealing of the packages. Rollers **60** and **61** are provided with conventional webs at their periphery which extend in axial direction, as is known to the art, and which are coordinated with one another since both of these rollers **60** and **61** have their relative position with respect to one another fixed by means of suitable gears, so that these webs simultaneously press together the bands passing between the rollers **60**, **61** and by heating such bands serve to seal them together. As to this portion of the construction of the rollers **60** and **61**, here it should be understood that no further discussion is believed necessary since the details thereof are well known to the art.

As to the remaining structure of the sealing rollers, attention is now invited to FIG. 3 where there is illustrated one of both of such sealing rollers **60** and **61** in sectional view. Reference numeral **56** designates a driven shaft member which is mounted in the housing **1**. Shaft member **56** has secured at its end a curved gear **57** through the agency of a nut member **87** and a key or wedge **88**, as shown, this gear **57** meshing with an internal gear **59** carrying a roller **58**. A heating winding **78** mounted in the sleeve members **76**, **77** is arranged at the inner surface of the roller **58**. Heating winding **78** is supplied via conductors (not shown) arranged in the shaft member **56** through the agency of a rotating current tap disposed at the housing **1**.

Continuing, it will be understood that the sleeve member **76** is connected via screws **79** or the like with the roller **58**. Sleeve member **78** engages via its teeth **80** with appropriate teeth **81** provided at the gear **59** and therefore ensures for the entrainment of the roller **58**. The latter is closed towards the front by means of a suitable cover member **82** secured through the intermediary of screws **81**. The meshing of both gears **57** and **59** is laterally ensured for by the snap rings **84** and the plate springs **86** supported at the rings **85**.

By means of this curved teeth coupling between the roller **58** and the shaft member **56** it is possible for the roller **58** to carry out a cardan motion with respect to the shaft member **56**, with entrainment occurring practically free of play, and for such roller **58** to accommodate itself to the counter roller **61**. As a result, there is ensured for a faultless contact of the rollers **60** and **61**.

In order to render possible the filling of the portions emptied out of the impeller wheel **40** into the infeed funnel **5**, it is advantageous if, prior to pouring of the fillable material, already a portion of the package is sealed. This can be achieved by appropriate coordination of the position of the impeller wheel **40** and the position of the rollers **60** and **61**. Hence, both of the bands **8** and **9** are thus presealed at the bottom or floor region and partially along the sides, so that a small pocket or trough appears which can be enlarged by spreading apart both bands **8** and **9** through the action of the infeed funnel **5** which extends into this pocket. The fillable material is emptied into such pocket from the impeller wheel **40** and thereafter the sealing operation is further carried out in order to finish sealing the package.

Both of the bands **8** and **9** which have now been sealed and combined into a single band at the sealing station **10**, upon leaving the latter arrive at the cutting mechanism **11**, the rollers **62** and **63** of which possess circular knife means, as will be more fully explained with respect to FIG. **4**. Referring now to this figure, it is to be understood that reference numerals **64** and **65** designate the shaft members for the rollers **62** and **63** respectively. Secured to the shaft members **64** and **65** are the respective sleeve members **66** and **67** having the elastic roller bodies **68** and **69** respectively. Rollers **62** and **63** are subdivided into two components, between which an upper circular knife **70** is arranged at the roller **63** and a lower circular knife **71** at the roller **62**, These knives being arranged in such a fashion that they laterally cooperate with one another. Both circular knives **70** and **71** are mounted at suitable supports **72** and **73**, respectively. The band which is fed from above into the rollers **62** and **63** is divided along a lengthwise cutting line by the circular knives or cutters **70**, **71**.

Now from the cutting mechanism **11** the band which has now become a double band is fed to a further cutting mechanism **12** in which the band is cut up into individual bags or packages by performing horizontal cuts at this continuous band. Cutting station **12** is composed of a rotating roll-shaped body member having at least one, but preferably for instance two cutting knives **74**, the cutting edges of which are slightly inclined with respect to the axis of rotation and wherein when a cutting edge **75** moves across the band produces horizontal cuts which divides the bank into individual packages or bags. These packages then fall, as already mentioned, onto the chute or slide **13** and move to both of the discharge members or outlets *13a* and *13b*.

It should be appreciated that with the described packaging equipment the production capacity can be considerably increased in contrast to the known constructions of packaging equipment. In so doing, it is not necessary to develop a complicated and bulky machine. In fact, the dimensions of the described packaging machine of the invention are not considerably greater than those of the initially described known machinery. This increase in production capacity is achieved without being at the expense of affording a protective treatment or handling of the fillable material. Moreover, the dosing mechanism which is used in the inventive equipment is designed to provide a more protective treatment of the fillable material.

The increased capacity or output of the machine is enhanced also through the use of two bands for the fabrication of the packages or bags, wherein folding of a band, as such was required with the prior art equipment using one band, can be prevented. Furthermore, the control mechanism utilized with the inventive equipment for obtaining synchronism of the bands also contributes to the increase in the capacity of the machinery.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

Accordingly, what is claimed is;

1. A packaging machine for the production, filling, and closing of substantially flat packages which are sealed at all sides and formed from heat-sealable band material and for packaging granular, fibrous or foliated pourable materials, comprising infeed container means for the pourable material to be packaged, a quantity dosing mechanism disposed after and in material flow communication with said infeed container means for dosing the pourable material received from said infeed container means, said dosing mechanism incorporating a predosing device and a fine-dosing device for the pourable material, said fine-dosing device including a dosing wheel member, an infinitely variable drive mechanism for said dosing wheel member for selectively regulating the rotational speed thereof to control the fine dosing of the pourable material, said predosing device incorporating adjustable vane means selectively positionable with respect to the other surface of the dosing wheel to form therewith an adjustable dosing gap for controlling the pour height of the pourable material onto said dosing wheel member and to thus control the coarse dosing of the pourable material, said dosing mechanism further including an impeller wheel possessing a plurality of material receiving pockets of constant size and arranged after said dosing wheel member for dispensing portions of said pourable material, means for selectively indexing said impeller wheel to control the size of the material portions received in said constant size pockets of said impeller wheel, a sealing station for forming packages from two heat-sealable bands arranged beneath and in material flow communication with said quantity dosing mechanism, said sealing station comprising a pair of cooperating heatable sealing rolls, means for delivering said two heat-sealable bands beneath said quantity dosing mechanism in a position to receive pourable material therefrom and to said sealing rolls, and means for ensuring for synchronous travel of said two heat-sealable bands to said sealing station.

2. A packaging machine as defined in claim **1**, further including a cutting station for cutting the heat-sealable bands which are connected to one another at said sealing station into individual packages.

3. A packaging machine as defined in claim **1**, wherein said delivery means incorporates mechanism for delivering each respective heat-sealable band from one side of said sealing station to said sealing rolls.

4. A packaging machine as defined in claim **1**, wherein said means for ensuring for synchronous travel of said two heat-sealable bands comprises photocell means for scanning each of said bands and an adjustment mechanism for controlling

the speed of travel of each of said bands, said adjustment mechanism for controlling the synchronous travel of each band comprising a head member provided with an apertured plate subjected to negative pressure and for applying suction to the associated band to thereby apply a braking force to such band.

5. A packaging machine as defined in claim 1, wherein said infeed container means is provided with a feed opening, said adjustable vane means of said predosing device being disposed at the region of the crown of said dosing wheel member and said feed opening of said infeed container means, said feed opening of said infeed container means, viewed in the direction of rotation of said dosing wheel member, being situated in front of said crown of said dosing wheel member, and gate means for sealing said feed opening of said infeed container means towards the discharge side of said dosing wheel member.

6. A packaging machine as defined in claim 2, wherein said cutting station is equipped with cutting roll means.

7. A packaging machine as defined in claim 6, wherein said adjustable vane means, said dosing wheel member, said impeller wheel, said bands, said sealing rolls and said cutting roll means each possess a width sufficient to permit the simultaneous production of two packages

8. A packaging machine as defined in claim 1, further including a drive shaft for at least one of said sealing rolls, and a curved gear coupling arrangement for hingedly connecting at least said one sealing roll with said drive shaft.

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