June 4, 1968 J. S. KANAREK 3,386,602

DE-PACKAGING APPARATUS AND METHOD

Filed April 26, 1966 2 Sheets-Sheet 1

Fig. 1.

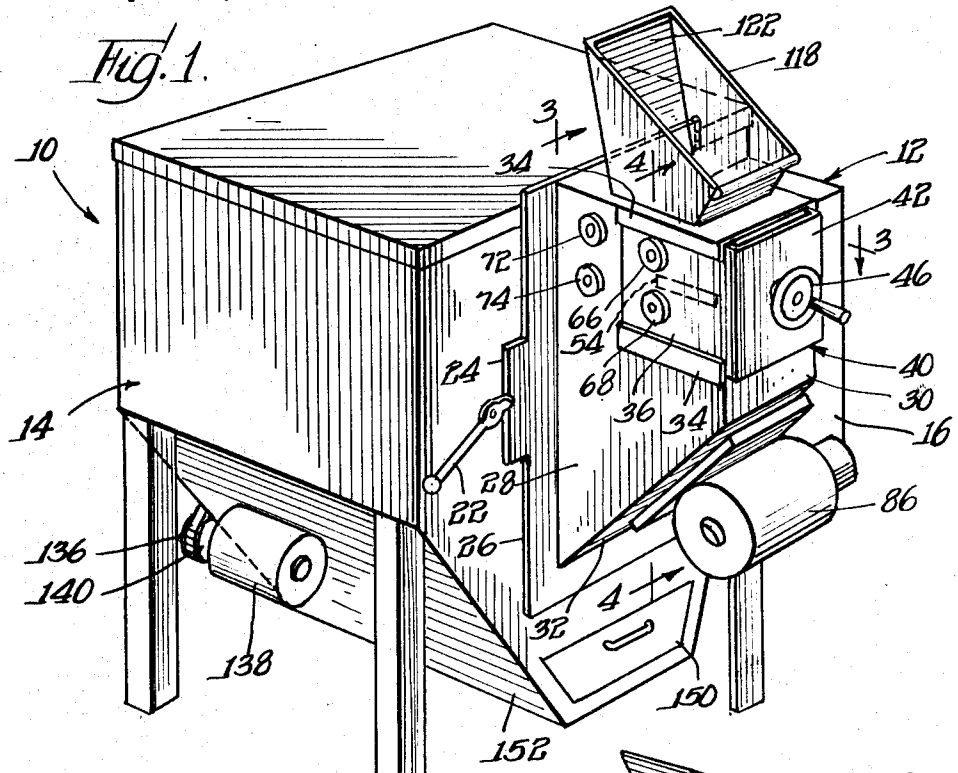
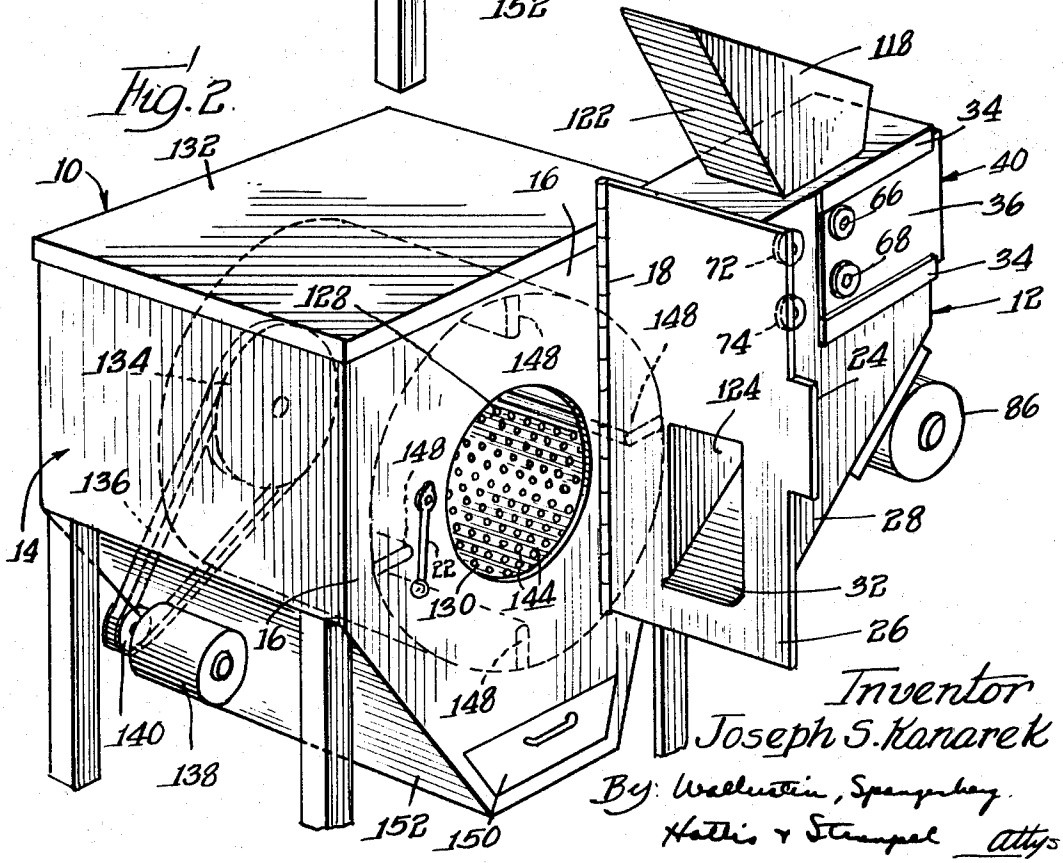


Fig. 2.

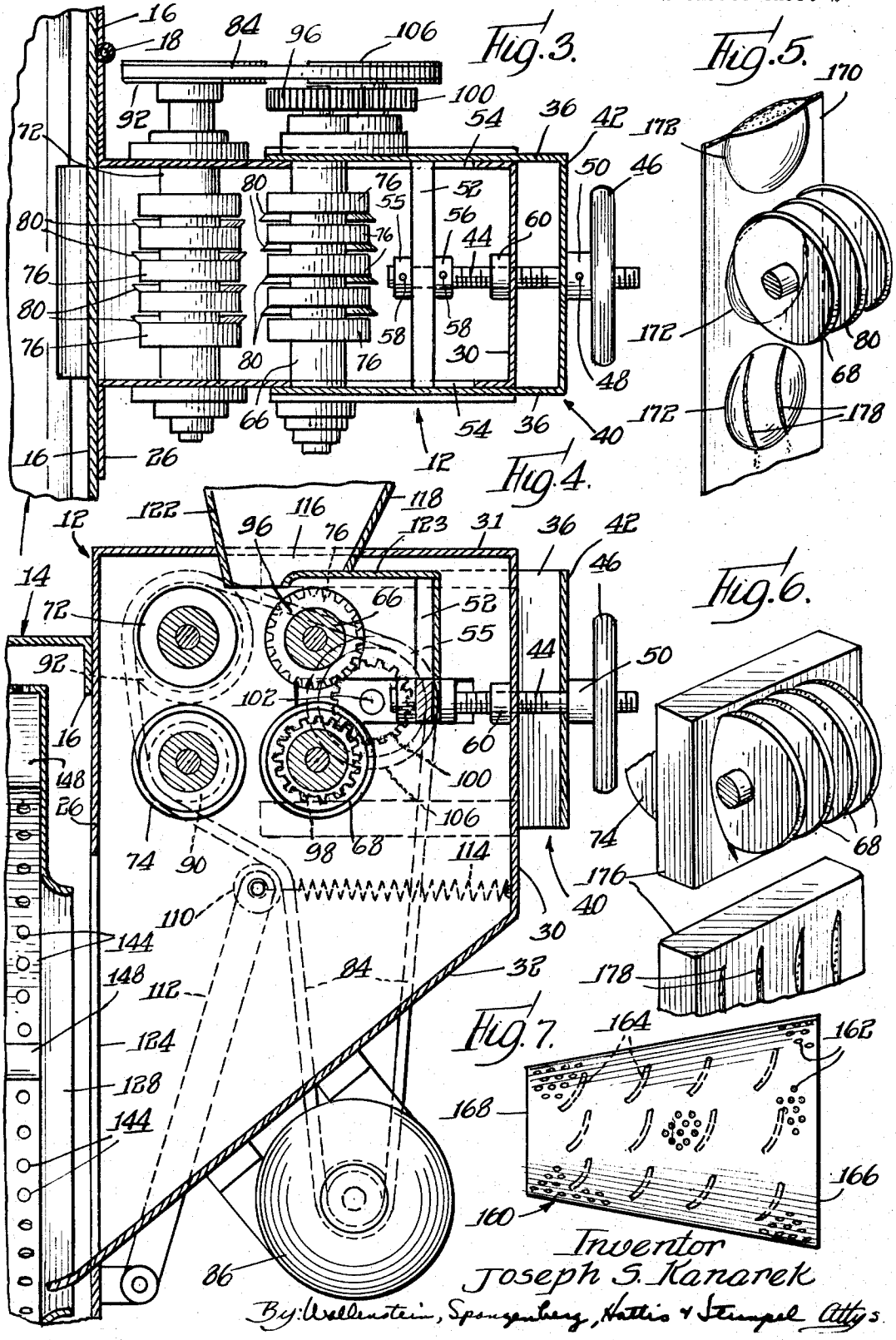


Inventor
Joseph S. Kanarek
By: Wallenstein, Spangenberg, Hattis & Strampel Attys

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DE-PACKAGING APPARATUS AND METHOD

Joseph S. Kanarek, 5435 W. 63rd St., Chicago, Ill. 60638

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ABSTRACT OF THE DISCLOSURE

Apparatus for removing and separating particulate, pulverulent, or liquid material from a severable wrapper or package which apparatus includes feed rollers and cutting rollers for automatically receiving and cutting or slitting the wrappers or packages to be processed to expose the contents thereof and for automatically delivering the cut or slit wrappers or packages to a de-packaging station which comprises a tumbler having a movable basket for distorting the cut or slit wrappers or packages and agitating the material therein to cause the same to pass through the openings in the cut or slit wrappers or packages without contaminating said material with fragments or the like from the wrappers or packages. The basket of the tumbler has perforations therethrough of a size to enable material removed from the cut or slit wrappers or packages to pass out of the basket into a receptacle.

The present invention relates to improved apparatus and method for removing and separating particulate, pulverulent, or liquid materials from wrappers or packages.

The salvaging of materials, especially flowable materials such as tea, coffee, gelatin, liquid flavoring agents, detergents, soaps, and the like, which, for one reason or another, have been defectively wrapped or packaged is an important economic consideration to processors and manufacturers of these materials. While various machines heretofore have been developed for reclaiming packaged materials, they have not, so far as is known, been accorded widespread acceptance. Whether this apparent lack of acceptance is due to the complexity and, therefore, high cost of such prior art machines, or to their limitations with respect to the types of packages that can be processed through them, or other functional disadvantages, is not clear, but it is known that in a number of areas, especially in the food packaging industry, de-packaging of various materials still is performed manually despite the availability of these prior art machines.

The present invention provides apparatus for de-packaging materials in particulate, pulverulent, or liquid form which is of compact, self-contained, relatively inexpensive construction and has unique versatility from the standpoint both with respect to the quantity of items that can be processed through it in unit time, and with respect o the types, shapes and sizes of wrappers or packages for which it has utility. The apparatus of this invention enables complete removal of the desired material to be attained without any concomitant contamination of the material due to fragmentation, abrasion, tearing, scraping, or ripping of the wrapper or package containing the material. After initial minimal and simple adjustments to accommodate it to the type and/or size of the wrapper or package to be processed through it, the apparatus is self-operating and requires no close supervision by operating personnel.

Briefly, the preferred apparatus of the present invention comprises a package receiving station, a package feeding station, a package opening or cutting station, and a tumbling station all compactly arranged in a self-contained unit. The receiving station can take the form of a hopper,

a conveyor belt system, or other suitable arrangement. In the illustrative embodiment of the invention described hereinafter in detail, a hopper-like receiving station is employed. The package feeding station of the apparatus preferably comprises a pair of oppositely revolving feed rollers which are adjustable with relation to one another to shorten or increase the distance therebetween to accommodate wrappers or packages of different sizes and shapes. The package opening or cutting station preferably comprises a pair of oppositely revolving slitter rollers which, like the feed rollers, are adjustable with relation to one another to decrease or increase the distance therebetween. To facilitate adjustment of the distance between the feed rollers and the slitter rollers, one of the feed rollers and one of the slitter rollers advantageously are mounted on a movable frame which is operated by a single adjusting wheel thereby to enable adjustment of the relative distances between the feed rollers and the slitter rollers to be uniformly, simultaneously and accurately made. Both the feed rollers and the slitter rollers preferably rotate in directions which tend to move the wrappers or packages toward the tumbling station but the relative peripheral speeds thereof are adjusted so that the slitter rollers move at an appreciable speed relative to the wrappers or packages fed thereto so that the wrappers or packages are cleanly cut.

The tumbling station essentially comprises a perforated basket which desirably revolves about a horizontal axis. The wrappers or packages from the cutting station enter the revolving basket through an opening in the end thereof and are engaged and raised in the basket by a plurality of spaced baffles extending inwardly from the basket walls and which, with the rotary movement of the basket, provide a tumbling action for removing completely the particulate or pulverulent material from the wrappers or packages. The perforations in the basket are of sufficiently large size to permit the material removed from the wrappers or packages readily to pass therethrough and be conveyed to or dropped into a collecting station but of sufficiently small size to prevent the empty wrappers or packages from passing therethrough. Means can be provided for continuously removing the emptied wrappers or packages from the basket thereby to prevent any interference therefrom to the tumbling and material removal operation. The apparatus easily can handle the sturdiest paperboard, cardboard, metal foil, or plastic types of packages used in the marketing of flowable materials such, for example, as gelatins, custard and tapioca mixes, soft drink mixes, detergents, soaps, and many others. It is ruggedly constructed, requires minimum maintenance, and is of a size such that it can be readily moved to any desired location in a processing or manufacturing plant.

Other objects, advantages and features of the invention will become apparent upon making reference to the specification to follow, the claims and the drawings wherein:

FIG. 1 is a view in perspective of an embodiment of the de-packaging apparatus of the present invention;

FIG. 2 is a view in perspective of said embodiment illustrating in greater detail the tumbling station of the apparatus;

FIG. 3 is a fragmentary horizontal sectional view taken substantially along line 3—3 of FIG. 1;

FIG. 4 is a fragmentary vertical sectional view taken substantially along line 4—4 of FIG. 1;

FIG. 5 is a fragmentary view in perspective illustrating the opening of one type of package at the cutting station of the apparatus of FIG. 1;

FIG. 6 is a fragmentary view in perspective illustrating the opening of another type of package at the cutting station of the apparatus of FIG. 1; and

FIG. 7 is a fragmentary view in perspective of a variant form of the tumbling station of the apparatus.

Referring now more particularly to FIGS. 1 and 2 of the drawings, the embodiment of the apparatus illustrated and designated generally by reference numeral **10**, comprises a package receiving and cutting portion **12** and a table-like tumbling and material collecting portion **14**. The portion **12** advantageously is joined to the front side wall **16** of the portion **14** by a hinge **18**. The portion **12** is maintained in operative position with relation to the portion **14** by a latch **22** which engages an extension **24** formed in the rear wall **26** of the portion **12**.

The portion **12** of the apparatus **10** has side walls **28—28**, joined along their inner edge to the outer surface of the rear wall **26**, a front wall **30**, an upper wall **31** and a downwardly slanted bottom wall **32**. The side walls **28—28** are each provided with upper and lower guide members **34—34** which engage the upper and lower edges of the side walls **36—36** of a movable U-shaped, roller-adjusting member **40**. The front wall **42** of the roller-adjusting member **40** has a substantially centrally located opening therethrough which receives an adjusting screw **44**. To outer end of the screw **44** there is secured an adjusting wheel **46** having a set screw **48** in the neck **50** thereof. The inner end of the screw **44** passes through a bar or plate **52**, the ends of which pass through slots **54—54** in the side walls **28—28** of the portion **12** and are secured in the side walls **36—36** of the roller-adjusting member **40**. The inner end of the screw **44** is held in fixed relation to the plate **52** by means of an inner collar **55** and an outer collar **56** each having set screws **58—58**. Intermediate its ends, the screw **44** passes through a threaded nut **60**, one side of which is secured, as by welding, to the inner surface of the front wall **30** of the portion **12**.

The side walls **36—36** of the roller-adjusting member **40** carry a feed roller **66** and a slitter roller **68**, the ends of the shafts of which are suitably journaled for rotation. Similarly, the side walls **28—28** of the portion **12** carry a feed roller **72** and a slitter roller **74**, the ends of the shafts of which also are suitably journaled for rotation. The feed rollers **66** and **72** are of the friction type and are of similar construction, each having a plurality of raised, longitudinally spaced, circumferential bands or strips **76** of rubber, or a rubber-like, material secured on the shaft thereof. It should be understood, of course, that the construction of the feed rollers may vary. Thus, for example, cogged or puncturing type rollers may be substituted for the friction rollers **66** and **72**. The slitter rollers **68** and **74** also are of similar construction, each having a plurality of raised, longitudinally spaced, circumferential cutting blades **80** formed on the shaft thereof. As best illustrated in FIG. 3, the feed rollers **66** and **72** are positioned above their respective associated slitter rollers **68** and **74** in a manner such that the cutting blades **80** of the slitter rollers will be substantially vertically aligned with the spaces between the bands or strips **76** of the feed rollers, and the feed roller **66** and the slitter roller **68** are positioned in a horizontal plane with relation to the feed roller **72** and the slitter roller **74** in a manner such that the respective faces of the cutting blades **80** are oppositely disposed thereby enabling the blades **80** to shear a wrapper or package passing therebetween and to thus provide a clean, sharp cut.

Referring now in greater detail to FIGS. 3 and 4 of the drawings, the feed rollers and the slitter rollers are made to revolve by a single drive belt **84** driven by a motor **86**. As indicated hereinabove, the peripheral speed of the feed rollers advantageously is different from that of the slitter rollers. In the embodiment of the invention illustrated, the difference in peripheral speed of the feed rollers is from about 10 to 20% less than that of the slitter rollers, and has the effect of enabling the cutting blades of the slitter rollers to make a cleaner and more complete cut in the material of which the wrapper or package is made. The cleaner cut thus attained reduces to a substantial extent the possibility of the reclaimed contents of the wrapper or package becoming contaminated with particles of foreign matter from the wrapper or package which might otherwise occur if the packaging material was torn, ripped or abraded by too rapid movement of the wrapper or package between the cutting blades. The difference in peripheral speed between the feed roller **72** and the slitter roller **74** is achieved by securing a pulley **90** to one end of the shaft of the slitter roller **74** and a pulley **92**, of larger diameter than pulley **90**, to one end of the shaft of the feed roller **72**. This arrangement will cause the roller **74** to revolve at a greater speed than the roller **72** in response to the driving action of the motor driven belt **84**. A corresponding difference in peripheral speed between the feed roller **66** and the slitter roller **68** is attained by mounting a gear **96** on one end of the shaft of the feed roller **66**, and a gear **98** on the corresponding end of the shaft of the slitter roller **68**. The gear **96** associated with the feed roller **66** differs from the gear **98** of the slitter roller **68** in that it has a greater number of teeth. The gears **96** and **98** cooperate with an idler gear **100** of the same size and having the same number of teeth as the gear **98** of the slitter roller **68**. The gear **100** is mounted on a bushing on a stationary shaft **102** secured to the side wall **28** of the portion **12**. The shaft **102** is provided with a pulley **106** which engages the drive belt **84** and rotates the idler gear **100**. Tension is maintained on the drive belt **84** by a pulley **110**, carried at one end of a pivotable lever **112**, and a tension spring **114**. In the embodiment illustrated, the feed roller **72**, the slitter roller **74** and the idler gear **100** and its associated pulley **106** all revolve in the same direction. As viewed in FIG. 3, the direction of rotation thereof is clockwise. The feed roller **66** and the slitter roller **68**, on the other hand, revolve in the opposite direction, that is, counterclockwise as viewed in FIG. 3. The opposed direction of rotation of the respective rollers thus acts to propel the wrappers or packages fed into the apparatus downwardly and substantially vertically with respect to the axis of rotation of the rollers.

Referring now to FIGS. 2 and 4 of the drawings, an opening **116** is provided in the upper wall **31** of the portion **12**. Joined to the upper wall **31** at the opening **116** is a hopper **118**, the rear wall **122** of which extends inwardly of the wall **31** and serves, with a guard plate **123** mounted on the plate **52**, to guide wrappers or packages between the feed rollers. After the wrappers or packages have passed through the slitter rollers, they slide downwardly on the inner surface of the slanted bottom wall **32** and pass out an opening **124** in the rear wall **26** of the portion **12**. The opening **124** is positioned opposite an opening **128** in the end of a cylindrical basket **130** which is mounted within the portion **14**. The basket **130** is journaled on the rear wall **132** of the portion **14** and rotates about a horizontal axis. A pulley **134** is secured to the shaft of the basket. The pulley **134** engages a drive belt **136** which is driven by a motor **138** having a pulley **140** secured to the shaft thereof. The wall of the basket **130** has a plurality of perforations **144** therethrough of a size to permit reclaimed material easily to pass out of the basket but to prevent the empty wrappers or packages from passing therethrough. In order to enhance, augment and promote the tumbling action of the basket **130**, a plurality of spaced, longitudinally and inwardly extending fins or baffles **148** are secured to the inner wall of the basket. The baffles **148** serve to scoop up, lift and tumble the wrappers or packages as they pass into the basket through the end wall opening **128** of the basket as they are delivered from the receiving and cutting portion **12**. The reclaimed material emptied from the wrappers or packages as they are tumbled in the basket **130** is collected in a drawer or bin **150** positioned in a compartment **152** formed at the base of the portion **14**.

In FIG. 7 of the drawings there is illustrated a variant embodiment of the basket **130**. The wall of the basket **160** there shown is tapered rearwardly, and like the basket **130**, is provided with a plurality of perforations

162. Instead of fins or baffles, the basket 160 has a plurality of spaced, inwardly extending directional vanes 164 secured on the inner surface thereof, and instead of one opening it has a receiving opening 166 and a disposal opening 168. This arrangement enables the emtied wrappers or packages to pass into and out of the basket 160 in a continuous stream thereby eliminating the necessity for periodically stopping the apparatus to remove empty wrappers or packages which have accumulated in the basket. In addition to the form shown in the drawings, the basket may be in the shape of a four-, six-, or eight-sided polygon. Such a construction would provide the necessary tumbling action without the need for baffles, or the like.

An extension cord (not shown) for connection to an electrical outlet, an "on" "off" switch (not shown) are provided for the apparatus 10.

In FIGS. 5 and 6, two different types of wrappers or packages are shown passing between the slitter rollers 68 and 74. The package 170 illustrated in FIG. 5 is a continuous strip having spaced pockets 172 containing ground coffee. This type of package is used in automatic vending machines for dispensing hot coffee. The package 176 shown in FIG. 6 is the type used for packaging products such as gelatin. The package 176 has a rather thick outer sheet formed of paperboard, and an inner waxed paper, or the like, envelope for the gelatin. The slitter rollers cut both sides of the pockets 172 and the package 176 as they pass between them. While it should be understood that the slitter rollers can be modified to provide openings 178 on only one side of a wrapper or package, in the preferred embodiment illustrated, openings on both sides are made to facilitate emptying of the wrappers or packages at the tumbling station.

In utilizing the apparatus of the present invention, the spacing between the feed rollers 66 and 72 and the slitter rollers 68 and 74 is initially adjusted to accommodate the size of the wrapper or package to be processed through the apparatus. While this adjustment can be made with the apparatus in operation, it is preferred to do so at the outset. Adjustment of the spacing between the rollers is attained by turning the wheel 46 to cause the movable member 40 to move inwardly or outwardly with relation to the front wall 30 of the portion 12. Since the threaded nut 60 is secured to the fixed front wall 30, turning of the wheel 46 causes the screw 44 to thread through the nut 60 whereby the member 40 is made to slide along the guides 34—34 secured to the sides 28—28 of the portion 12. The member 40 thus acts to bring the rollers 66 and 68 journaled thereon nearer or farther from the rollers 72 and 74 journaled on the side walls 28—28. After the rollers have been adjusted, the apparatus is switched on and wrappers or packages are fed into it through the hopper 118. Each wrapper or package is engaged by the slower revolving feed rollers 66 and 72 and advanced toward the faster revolving slitter rollers 68 and 74. The cutting blades 80 on the rollers 68 and 74 cleanly and sharply sever the wrappers or packages on both sides, providing a plurality of openings 178 therein which expose the contents of the wrappers or packages. A second set of feed rollers can be provided below the slitter rollers to engage the wrappers or packages as they pass therebetween. These rollers, like the feed rollers 66 and 72 also would have a peripheral speed less than that of the slitter rollers 68 and 74, and would act to retard the speed at which the wrappers or packages leave the cutting blades 80 thereby assuring a cleaner sharper cutting action by the blades 80. After the opened wrappers or packages pass from between the rollers 68 and 74 they slide down the inner surface of the bottom wall 32 of the portion 12 and out the opening 124 in the rear wall 26. As the opened wrappers or packages leave the portion 12 through the opening 124 they pass into the basket 130 through the opening 128 in the end thereof. In the basket, the wrappers or packages are scooped up and lifted by the baffles 148 as the basket rotates. The tumbling effect thus provided by the combined action of the rotating basket and its associated baffles serves to effectively and completely remove the contents of the opened wrappers or packages. The freed contents pass through the perforations 144 in the basket and into the bin 150. The emptied wrappers or packages remain in the basket and can be removed periodically when required. The apparatus can process wrappers and packages as rapidly as they are fed into it without jamming. The enclosed construction of the apparatus substantially eliminates any dusting problems. The reclaimed material is free from contamination and can be immediately re-processed as desired.

It should be understood that various modifications may be made in the preferred form of the invention above described without deviating from the broader aspects of the invention. Thus, for example, wrappers or packages can be fed to the slitters by means of a conveyor, screw, or mechanical pusher, in lieu of feed rollers as described. Also, continuous removal of reclaimed material from the tumbling station can be attained by mechanical means, for instance, a screw. These, and other variations which will occur to those skilled in the art upon reference to the present disclosure are, therefore, intended to fall within the scope of this invention as set forth in the appended claims.

What is claimed is:

1. Apparatus for removing and separating particulate, pulverulent, or liquid material from a severable wrapper or package, said apparatus including means for first automatically cutting the wrappers or packages to be processed to expose the contents thereof and for automatically delivering the cut wrappers or packages to a de-packaging station, comprising a tumbler at said de-packaging station for receiving the cut wrappers or packages, said tumblers having a movable basket provided with an inlet opening for receiving the cut wrappers or packages delivered thereto and means for tumbling the cut wrappers or packages to distort them and to agitate the material in the wrappers or packages without contaminating said material with fragments or the like from the cut wrappers or packages and causing the material to pass through the openings therein formed by the cutting operation, said basket having perforations therein of a size large enough to enable said material removed from the cut wrappers or packages to pass out of the basket but small enough to prevent the empty wrappers or packages from passing therethrough, and means for receiving and collecting the material passing through said basket perforations.

2. Apparatus as claimed in claim 1 wherein the inlet opening of the basket is in an end wall thereof.

3. Apparatus as claimed in claim 1 wherein said means for tumbling the wrappers or packages extend longitudinally and inwardly from the basket side wall.

4. Apparatus as claimed in claim 3 wherein said means comprises a plurality of spaced baffles.

5. A method of removing and separating flowable material from a severable wrapper or package, comprising first cutting a wrapper or package to expose the contents thereof, delivering the cut wrapper or package to a de-packaging station, tumbling the cut wrapper or package at said station to distort the cut wrapper or package and to agitate the flowable material in a manner to effect removal of the flowable material and separation thereof from the wrapper or package without contaminating said material with fragments or the like from said wrapper or package, and collecting the flowable material as it is removed and separated from the wrapper or package.

6. A method as claimed in claim 5 wherein a rotary motion is employed to tumble the wrapper or package, and the wrapper or package is repeatedly lifted during its rotary movement at the tumbling station.

7. A method as claimed in claim 5 wherein the flowable material is continuously and immediately physically separated from the wrapper or package during tumbling.

8. A method as claimed in claim 5 wherein both sides of the wrapper or package are severed to facilitate removal of the flowable material therefrom.

9. Apparatus for removing and separating particulate, pulverulent, or liquid material from a severable wrapper or package, said apparatus including a pair of feed rollers and a pair of cutting rollers which rotate in opposite directions with relation to one another for automatically receiving and severing the wrappers or packages to be processed to expose the contents thereof and for automatically delivering the severed wrappers or packages to a de-packaging station, comprising a tumbler at said de-packaging station for receiving the severed wrappers or packages, said tumbler having a movable basket provided with an inlet opening for receiving the severed wrappers or packages delivered thereto and means for tumbling the wrappers or packages and agitating the material in the wrappers or packages and causing the same to pass through the openings therein formed by the severing operation, said basket having perforations therein of a size large enough to enable said material removed from the wrappers or packages to pass out of the basket but small enough to prevent the empty wrappers or packages from

passing therethrough, and means for receiving and collecting the material passing through said basket perforations.

10. Apparatus as claimed in claim 9 wherein the feed rollers and cutting rollers have different peripheral speeds.

11. Apparatus as claimed in claim 10 wherein the peripheral speed of the feed rollers is less than the peripheral speed of the cutting rollers.

12. Apparatus as claimed in claim 9 wherein at least one of each pair of said rollers is adjustable with relation to the other member of each of said pair of rollers.

13. Apparatus as claimed in claim 9 wherein said rollers are operated by common drive means.

14. Apparatus as claimed in claim 13 wherein said drive means comprises a motor driven belt.

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