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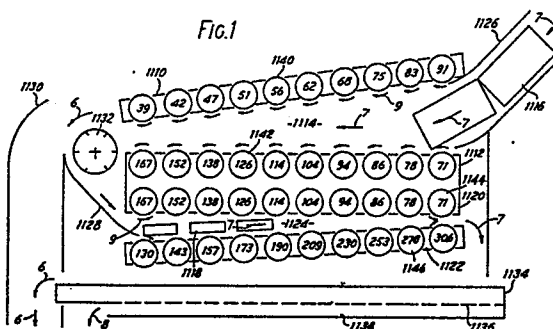
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⑤④ Package opening apparatus.

57) An apparatus for opening a wrapped bundle (1116) of cigarette packages and separating the wrapping from the packages comprises first and second opposed longitudinal arrays (1110,1112,1120,1122) of transverse rollers (1140,1142,1144,1146) defining a progressively narrowing channel (1114,1124) adapted to receive said wrapped bundles (1116), means (2202) for positively driving the rollers (1140,1142,1144,1146) so as to move the bundles (1116) through the channel (1114,1124) towards the narrow end of the channel, the arrangement being such that the peripheral speeds of the arrays (1110,1112,1120,1122) of rollers are unequal, thereby to exert a twisting or shearing action on the bundles as they pass along the channel so as to remove wrapping material from the bundle.



Description

PACKAGE OPENING APPARATUS

This invention relates to an apparatus for opening wrapped packages such as, but not exclusively, parcels or bundles of cigarettes, cigars, or other products of the tobacco industry.

In the tobacco industry it is occasionally necessary to return a packaged product to the manufacturer, if, for example the product is out of data due to failure to rotate stock, is being returned from marketing trials, or the packaging is damaged. Likewise, the manufacturer will not release a product to the retail trade if the product is damaged or otherwise does not meet the manufacturer's quality control standards. In many instances when a packaged product is returned or the manufacturer finds that a packaged product does not meet quality control standards it may nevertheless be found that the contents of the packages are of good quality and worth recovering.

In the cigarette manufacturing industry returned packages of cigarettes are frequently in the form of "bundles", a "bundle" being for example a wrapped parcel of several packets of cigarettes.

One known mechanical method for unwrapping bundles involves cutting into the bundle with one or more knives and then bending the bundle about its opposite, uncut surface so as to release the contents. This method, in common with some other methods, is liable to result in the cigarettes within the bundle being shredded during the cutting process so that fragments of wrapping material, paper and filter tip material become mixed with the tobacco, thus making it very difficult to separate the tobacco from such a mixture.

It is an object of the present invention to provide a means whereby a wrapped parcel of packets of cigarettes may be opened and the cigarettes released without contamination of the tobacco by packaging or other materials. The tobacco content of the released cigarettes may then be separated out by known methods or by a modification of the present invention.

According to the present invention there is provided an apparatus for opening a wrapped package of articles and separating the wrapping from the articles, the apparatus comprising first and second opposed longitudinal arrays of transverse roller means defining a progressively narrowing channel adapted to receive said wrapped package, means for positively driving the roller means so as to move the package through the channel towards the narrow end of the channel, the arrangement being such that the peripheral speeds of at least one pair of opposed individual roller means are unequal, thereby to exert a twisting or shearing action on the package as it passes along the channel so as to remove wrapping material from the package.

The roller means are preferably rollers.

The invention will now be described by way of example only with reference to the accompanying diagrammatic drawings in which,

Figure 1 shows a longitudinal sectional view

of an apparatus for separating packets of cigarettes from wrapped bundles of packets, and subsequently separating cigarettes from the packets;

Figure 2 shows a longitudinal sectional view of an apparatus for separating packets of cigarettes from wrapped bundles of packets; and,

Figure 3 shows a longitudinal sectional view of an apparatus for separating cigarettes from packets of cigarettes.

Referring to Figure 1 of the drawings there are shown first and second pairs of opposed arrays or beds 1110, 1112 and 1120, 1122 of transverse rollers 1140, 1142 and 1144, 1146 respectively arranged to define first and second progressively narrowing horizontally disposed channels 1114, 1124, channel 1124 lying underneath and parallel to channel 1114.

Both channels 1114, 1124 narrow from their respective entrances towards their respective exits, and the exit to channel 1114 lies over the entrance to channel 1124.

First and second inlet chutes 1126, 1128 are provided leading respectively to the entrance to channel 1114 and from the exit to channel 1114 to the entrance to channel 1124.

Inlet chute 1126 enables wrapped bundles 1116 of packets of cigarettes to be fed into channel 1114. Chute 1128 enables packets of cigarettes from unwrapped bundles to be fed from channel 1114 into channel 1124. A third chute 1130 is provided adjacent chute 1128 to receive waste wrapping material leaving channel 1114.

The rollers 1140, 1142 of the arrays 1110, 1112 and the rollers 1144, 1146 of the arrays 1120, 1122 are motor driven so as to rotate in the directions indicated by arrows 9, the effect of which is to propel an object in the respective channel along the channel from the entrance to the exit.

The peripheral speeds of the rollers are controlled by gearing between the rollers (this gearing is not illustrated in Figure 1) so that the peripheral speeds of rollers 1140, 1144 in arrays 1110, 1120 decrease from the entrance towards the exit of the respective channel, and the peripheral speeds of rollers 1142, 1146 in arrays 1112, 1122 increase from the entrance towards the exit of the respective channel.

The effect of the different peripheral speeds of opposing rollers is to exert a twisting and shearing action on the bundles 1116 in channel 1114 so as to tease the wrappers from the bundles and to spread packets 1118 of cigarettes resulting from the unwrapping along channel 1114, and, after the packets 1118 have been transferred to channel 1124, to break open the packets 1118 in channel 1124 so as to separate the cigarettes within the packaging material of the packets from the packaging material.

For convenience, the relative peripheral speeds of the rollers 1140, 1142, 1144, 1146 are indicated in Figure 1 by the numbers within the circles depicting the rollers.

In the arrangement as illustrated in Figure 1 the relationship between the peripheral speeds of opposed rollers defining a channel is an inverse relationship. In particular, if

$v(1140)$ = peripheral speed of a roller in array 1140

$v(1142)$ = peripheral speed of a roller in array 1142

$v(1144)$ = peripheral speed of a roller in array 1144

$v(1146)$ = peripheral speed of a roller in array 1146

then $v(1140) \times v(1142) = 6442$ (A)

and $v(1144) \times v(1146) = 21782$ (B)

The formulae (A) and (B) are of course specific to the illustrated embodiment of Figure 1 and are for example only. In the embodiments of Figures 2 and 3 described below the peripheral speeds and diameters of the rollers are chosen to provide a level of efficiency suited to those embodiments.

Between the exit to channel 1114 and the entrance to channel 1124 there is provided a paddle wheel 1132 the function of which is to separate the wrapping material finally from the bundles 1116 and to pass separated wrapping material into waste chute 1130 and to pass separated packets of cigarettes 1118 down chute 1128 into channel 1124 for subsequent separation into individual cigarettes.

A vibratory conveyor 1134 is provided below the level of channel 1124 to receive from the exit to that channel depackaged cigarettes and their packaging material. Within the vibratory conveyor 1134 is a screen 1136 that separates the depackaged cigarettes from their packaging material, the cigarettes falling through the screen into a compartment 1138 from which they are removed as indicated by arrow 8.

In operation, bundles 1116 of packages of cigarettes are fed down chute 1126 into channel 1114. Here the rollers 1140, 1142 tease the bundle wrappers away from the enclosed packages and spread out the packages as the bundles proceed along the channel. At the end of the channel 1114 the paddle wheel 1132 transfers the bundle wrappers to the waste chute 1130 and the packages 1118 down chute 1128 to channel 1124.

In channel 1124 the rollers 1144, 1146 similarly remove packaging from the cigarettes and transfer the packaging and the cigarettes to the vibratory conveyor 1134 where final separation of the cigarettes takes place, as described above. For convenience, in Figure 1 arrows 7 show the route taken by the bundles, arrows 8 show the route taken by the packages and cigarettes, and arrows 6 show the route taken by waste packaging material.

Referring in general to Figures 2 and 3, these show essentially the apparatus of Figure 1 separated into two units, one for opening bundles (Figure 2), and the other for opening packets (Figure 3). A feature in Figure 2 or 3 that corresponds to a feature in Figure 1 will be given the number of that feature in Figure 1 but starting with "2" or "3" respectively instead of "1".

Referring specifically to Figure 2 there is shown a gantry 2160 supporting upper and lower respective opposed arrays 2110, 2112 of transverse rollers 2140, 2142 defining a progressively narrowing horizontally disposed channel 2114. Wrapped bundles of packets of cigarettes are fed into the channel 2114 in the

direction of arrow 7 by means of a motor-driven infeed belt 2206.

The spacing of the upper array 2110 from the lower array 2112, and the angle between them, are adjustable by screw devices 2162 in the gantry supports 2160, thus enabling the ends of the upper array to be slid up and down as necessary in slots 2210 in the gantry. The rollers 2140, 2142 are driven as sets by electric motors 2202, 2204 respectively so as to urge a bundle of packets along the channel 2114 in the direction of arrow 7.

The speeds (in r.p.m.) of the top rollers 2140 are stepped by gears in the following manner in the direction of arrow 7: 71, 77, 61, 66, 52, 57, 45, 48, 38, 42, the rotational speed of each alternate roller being higher than the speeds of the rollers immediately preceding and succeeding it, but the rotational speeds of the set of top rollers nevertheless exhibiting an overall decrease along the channel 2114 from entrance to exit. The speeds of the lower rollers 2142 in contrast exhibit a gradual increase from 71 to 143 r.p.m. along the channel 2114 in the direction of arrow 7; this, in combination with the overall decrease in speed of the top rollers, exerts twisting and shearing forces on the bundles within the channel 2114 and teases the wrapping from the bundles.

When the separated packets and wrapping are discharged from the channel 2114 a blower 2208 blows the wrapping through a duct 2130 into a perforated waste bag 2162. The packets, being heavier than the wrapping, simultaneously drop into a packet trolley 2164, or onto an elevator (not shown in Figure 2), for subsequent transport to the packet opening apparatus of Figure 3.

Referring now to Figure 3 there is shown a gantry 3160 supporting upper and lower respective opposed arrays 3110, 3112 of transverse rollers 3140, 3142 defining a progressively narrowing horizontally disposed channel 3114. Packets of cigarettes are fed into the channel 3114 in the direction of arrow 7 via a band conveyor 3292 from an elevator 3290.

The spacing of, and angle between the arrays 3110, 3112 is adjusted in a similar manner to that described in Figure 2. The rollers 3140, 3142 are likewise driven as sets by electric motors 3202, 3204 respectively so as to urge the packets along channel 3114, and are of similar size, speed, gearing and configuration to those described in Figure 2.

As the packets pass between the arrays 3110, 3112 of rollers, the packets are split open in the same fashion as the bundles described above and the packet wrapping is teased away from the cigarettes within. Packet wrappings and cigarettes then fall into an inclined slatted rotary drum 3300 where the cigarettes fall through the slats onto a cigarette take-off conveyor 3134 below and the packet wrappings travel through to the end of the drum where they are discharged as waste.

In a modification of the embodiment of Figures 2 and 3 the roller diameters are 67 mm, the speeds in r.p.m. of the top rollers (2140, 3140) are: 70, 55, 60, 45, 55, 40, 45, 35, 40, 35 from infeed to discharge, and the speeds in r.p.m. of the bottom rollers (2142, 3142) are: 105, 115, 130, 140, 160, 170, 195, 215, 240, 265

from infeed to discharge. In this modification an air separation device is provided at the discharge end of the drum 3300 to allow any unopened packets to fall vertically from the drum through the curtain into a bin for adding back to the elevator 3290 for a second pass through the rollers, while the opened packets (the waste) is blown as it passes through the air curtain into a separate bin for disposal.

If required, a further channel defined by further arrays of rollers may be provided to separate cigarettes into tobacco and waste wrapping, the waste wrapping comprising cigarette paper and filter plugs.

In alternative embodiments one array of rollers may have a constant overall peripheral roller speed while the overall peripheral roller speed of the other array increases or decreases from the entrance to the exit of the channel, or both arrays of rollers may each have an overall decrease in peripheral roller speed in the same direction along the channel but the peripheral roller speed of one array decreases at a greater rate than that of the other, the overriding principle being that there is an overall peripheral speed differential between the arrays of rollers along the channel.

In an alternative embodiment the roller means in an array may be provided by a series of conveyor belts or bands, the peripheral speed of each belt being controlled individually by a motor or by gearing.

In alternative applications of the invention to packaged articles that are not of the tobacco industry the peripheral speeds and diameters of the rollers will depend on the circumstances, in particular the dimensions of the articles being unwrapped and the nature of the wrapping material.

Claims

1. An apparatus for opening a wrapped package of articles (1116) and separating the wrapping from the articles, the apparatus comprising first and second opposed longitudinal arrays (1110,1112,1120,1122) of transverse roller means (1140,1142,1144,1146) defining a progressively narrowing channel (1114,1124) adapted to receive said wrapped package, means (2202) for positively driving the roller means so as to move the package through the channel towards the narrow end of the channel, characterised in that the arrangement is such that the peripheral speeds of at least one pair of opposed individual roller means are unequal, thereby to exert a twisting or shearing action on the package as it passes along the channel so as to remove wrapping material from the package.

2. An apparatus as claimed in claim 1 wherein the peripheral speed of the roller means (1140) in said first array (1110) decreases overall along the channel (1114) relative to the overall peripheral speed of the roller means (1142) in said second array (1112).

3. An apparatus as claimed in claim 2 wherein the peripheral speed of the roller means (1142) in said second array (1112) increases overall along the channel (1114) from the exit towards the entrance of the channel.

4. An apparatus as claimed in claim 2 wherein the peripheral speed of the roller means (1142) in said second array (1112) is substantially constant.

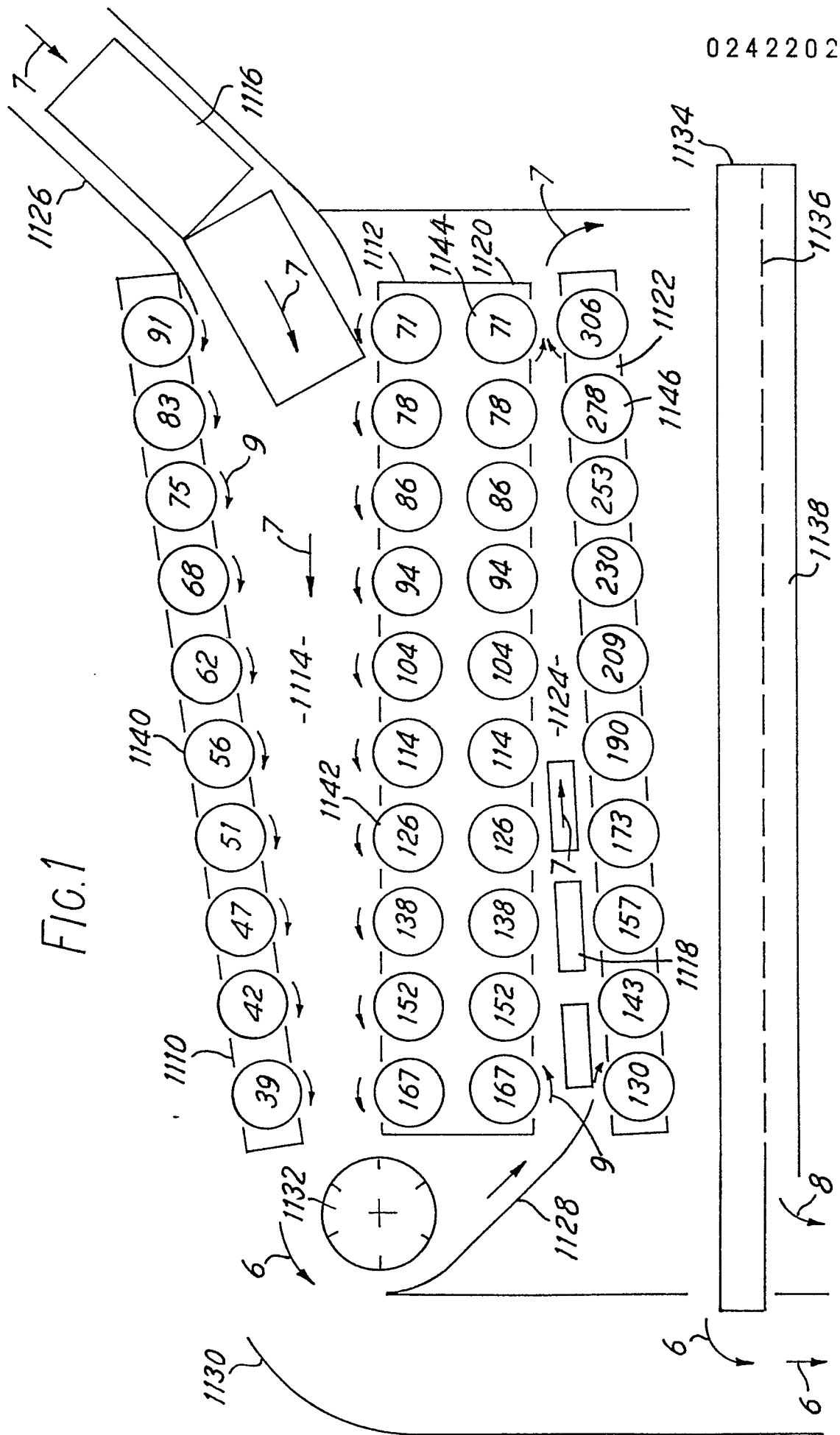
5. An apparatus as claimed in any preceding claim wherein, in a said array (1112,1122) of roller means that has an overall increase in peripheral speed of the roller means along the channel (1114), the rotational speed of each alternate roller means (1142,1146) is higher than the rotational speeds of the roller means immediately preceding and succeeding said alternate roller means.

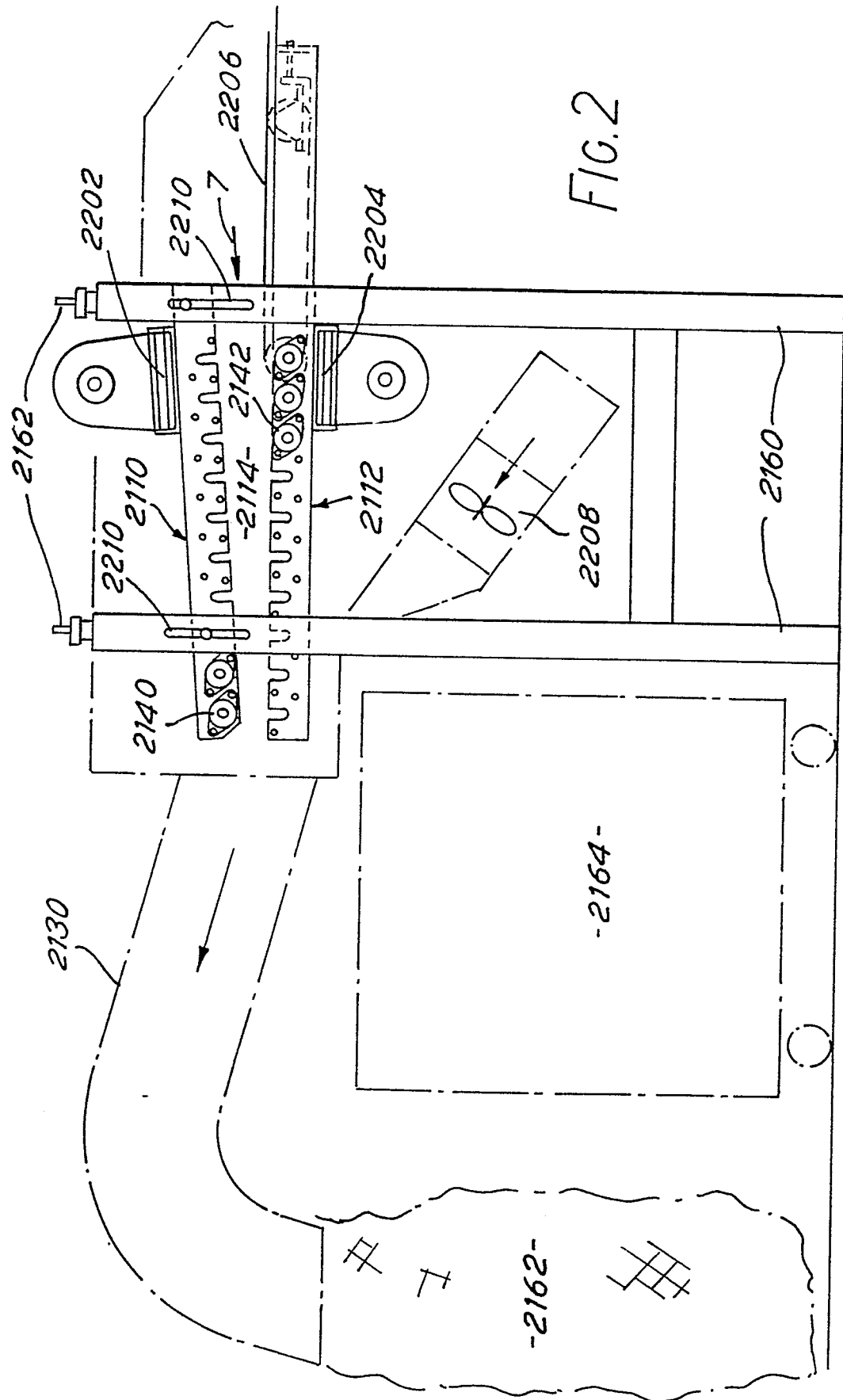
6. An apparatus as claimed in any preceding claim wherein the roller means are rollers (1140, 1142, 1144, 1146).

7. An apparatus as claimed in any preceding claim wherein there is provided means (1132, 2208) to separate unwrapped wrapping material from the package.

8. An apparatus as claimed in claim 7 wherein the separation means is provided by an air blower (2208).

FIG. 1





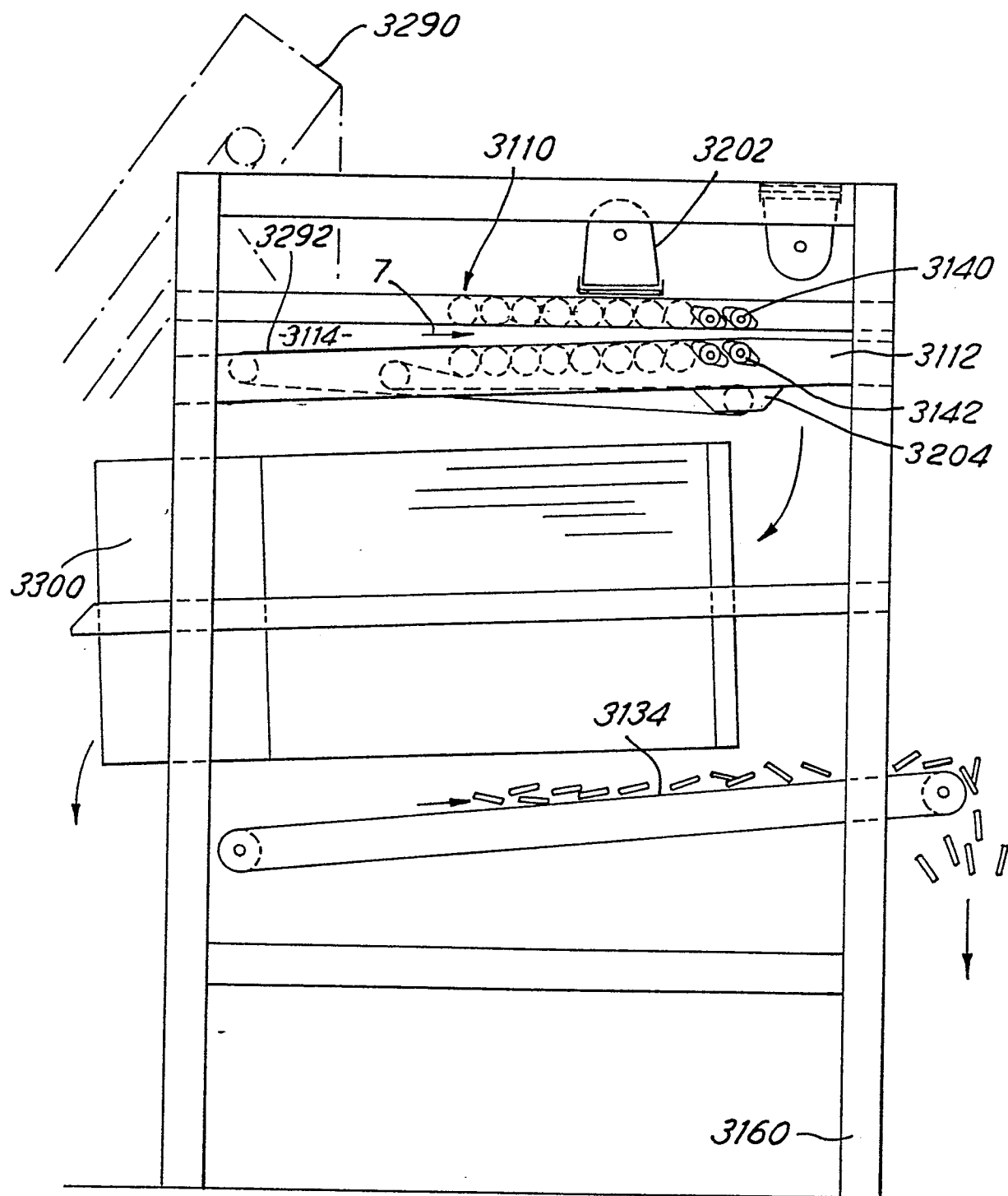


FIG. 3