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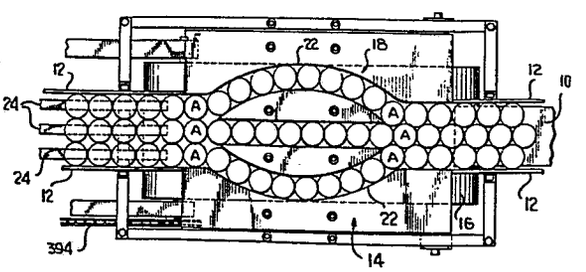
(54) Apparatus for supplying circular cross-section articles in longitudinally moving rows in a packaging apparatus.

(57) A packaging apparatus is disclosed having an apparatus for supplying articles of a circular cross-section in longitudinally moving transversely aligned rows. The supplying apparatus includes means (10) for arranging the articles in internested columns wherein transversely adjacent articles are longitudinally offset, and an aligning device (14) for moving adjacent articles into transverse rows. The aligning device includes guide means (18) defining a separate path (22) for each column of articles, the paths varying in length in accordance with the longitudinal offsetting of the transversely adjacent articles when internested.

FIG.3



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TITLE: APPARATUS FOR SUPPLYING CIRCULAR CROSS-SECTION ARTICLES IN LONGITUDINALLY MOVING ROWS IN A PACKAGING APPARATUS

The present invention relates to an apparatus for supplying articles of a circular cross-section in longitudinally moving transversely aligned rows for a package forming apparatus.

U.S. reissue patent No. Re. 28,535, granted September 2, 1975 describes a method and apparatus for packaging of clusters of articles, such as beverage containers, with a wrapping such as shrinkable plastic film or sheet. The containers are received at one end of a production line in random succession, are converted into groups or clusters appropriate for packaging, with the maximum dimension of the cluster transverse to the direction of conveyor movement. The clusters are then in the course of their continuous movement along the conveyor, enveloped with sheet material which is paid out in the longitudinal direction of conveyor movement. In final passage of the conveyor through an oven, the sheet material is adhered to bind the envelopment and is shrunk into tensed limited conformance with the cluster profile. Further a somewhat different package forming machine has been developed which has been demonstrated to others and is the subject of copending U.S. application Serial No. 734,876 entitled PACKAGE FORMING MACHINE, filed October 22 1976 which application issued on April 11, 1978 as U.S. Patent No. 4,083,163.

The packaging apparatus described herein is also the subject of copending European patent application no. 79300505.9.

The present invention seeks to provide an improved apparatus for supplying circular cross-section articles in longitudinally moving rows.

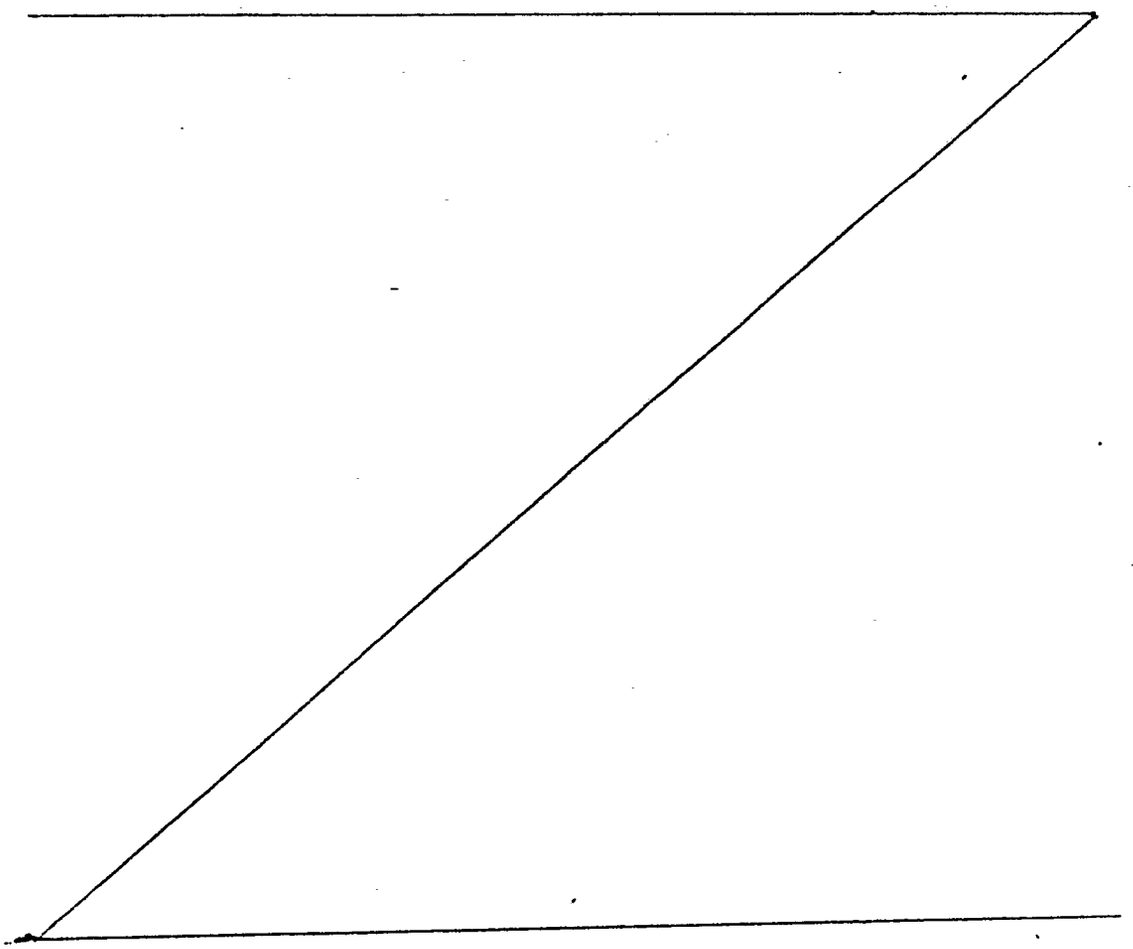
Accordingly, the present invention provides apparatus for supplying articles of a circular cross-section in longitudinally moving transversely aligned rows, characterised in that said apparatus includes means for arranging the articles in internested columns wherein transversely adjacent articles are longitudinally offset, and an aligning device for moving adjacent articles into transverse rows, said aligning device including guide means defining a separate path for each column of articles, said paths varying in length in accordance with the longitudinal offsetting of the transversely adjacent articles when internested.

Advantageously clusters of articles are formed into packages by wrapping with a surrounding wrap.

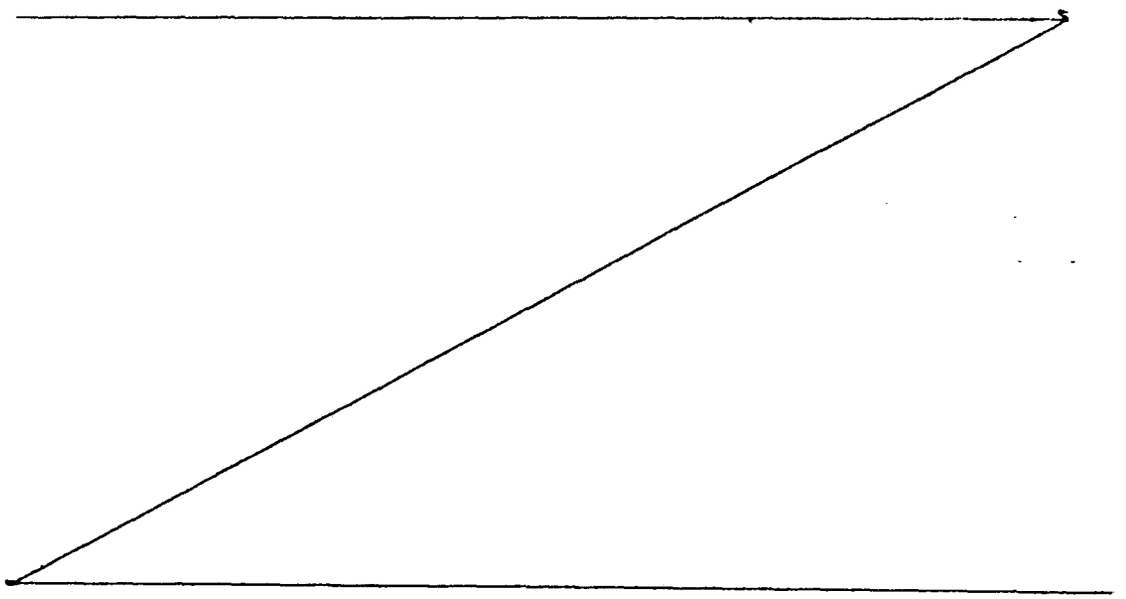
The clusters which are to be wrapped are supported by both upper and lower conveyors which move in unison with the upper conveyor or having retaining elements which serve to prevent tipping of the articles in the cluster

and at the same time assure a clamping of the wrap film relative to the clusters during the drawing thereof.

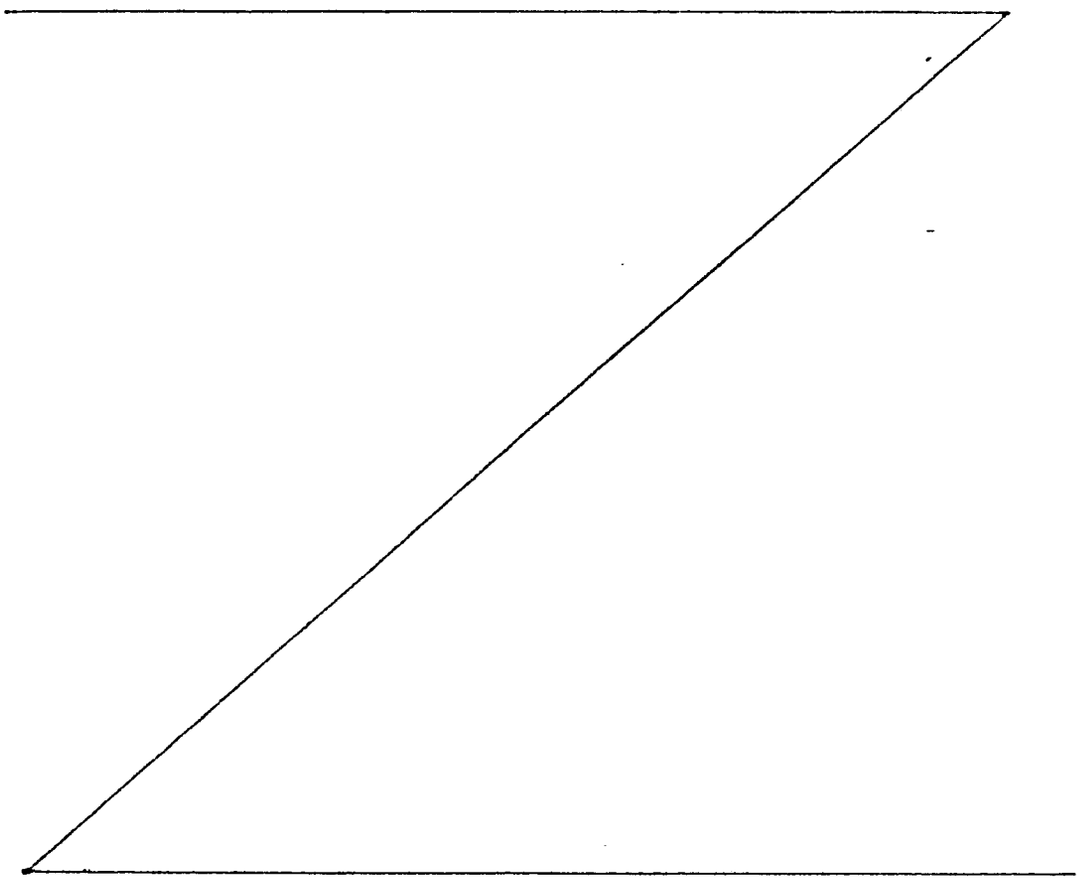
Advantageously the lower conveyor includes plural sets of individually mounted support elements which fully support the articles of the clusters and are at the same time individually movable with respect to the articles so as to permit the folding of the lower closure flaps beneath the cluster.



In one embodiment of the present invention simple means are provided for folding a rear closure flap beneath a cluster, the simple means being an auxiliary support which simultaneously folds the portion of a rear closure flap beneath the cluster and clamps the same against the underside of the cluster in a supporting relation for the rear portion of a cluster whereby the rear one of the support elements may be released from the cluster, after which air blast means carried by the auxiliary support may direct the rear closure flap fully beneath the closure to a position where the rear support element may return to its cluster supporting position with the rear closure flap in its fully folded position.

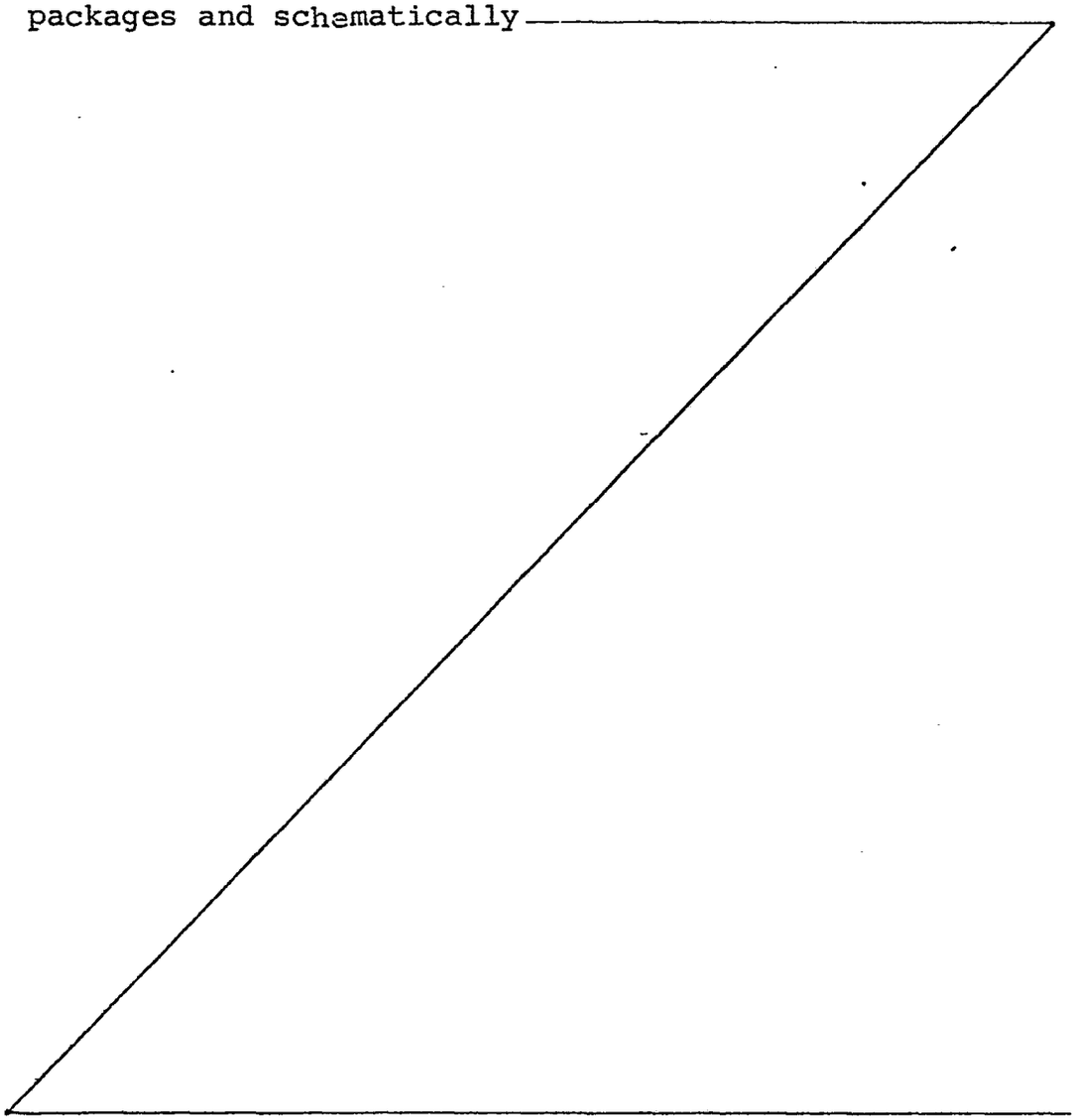


Advantageously the apparatus includes a wrapped package receiving platform which serves to support the front portion of a cluster while the rear of the cluster is still supported by a rear one of the support elements and the movement of the partially wrapped cluster onto the platform serves to fold the front bottom closure flap into place and at the same time tightly draws the wrap about the cluster to provde a tight package.



The present invention is further described hereinafter, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic side elevational view of the entrance portion of an apparatus for forming packages and schematically



shows the arrangement of containers into clusters and the feeding of clusters to the wrapping station;

Figure 2 is a schematic side elevational view showing the step-by-step sequence of wrapping a wrap film around a cluster of containers;

Figure 3 is a plan view taken along the line 3-3 of Figure 1, and shows specifically the manner in which nested columns of articles are longitudinally shifted relative to one another automatically to effect the arrangement of the articles in transversely aligned rows

Figure 4 is a side elevational view of the apparatus of Figure 3;

Figure 5 is a schematic side elevational view of the wrapping section of the machine for forming the wrapping sequence illustrated in Figure 2;

Figure 6 is an enlarged fragmentary side elevational view of the wrapping section at the entrance thereof;

Figure 7 is a schematic side elevational view showing the path of draw elements of the wrapping means including the manner in which the draw film is supported for severing thereby and the final function of one draw element of each pair to push wrapped clusters from the machine;

Figure 8 is a fragmentary side elevational view showing specifically the details of film severing means and the guard therefor;

Figure 9 is a schematic side elevational view showing the mounting and function of an auxiliary support for both supporting a rear portion of a cluster and folding a rear bottom closure flap therebeneath;

Figure 10 is a fragmentary side elevational view similar to Figure 9, showing the rear portion of a cluster supported by the auxiliary support and the rear bottom closure flap being blown into position, the view also showing the rear support element of the lower conveyor

means returned to its supporting position with respect to an adjacent cluster;

Figure 11 is a schematic side elevational view of the machine at the final wrap and discharge portions thereof, and shows the manner in which the partially wrapped cluster is transferred to a receiving platform in a manner wherein the wrapping is complete and the wrap is drawn tightly around the cluster;

Figure 12 is a view similar to Figure 11, but shows most specifically the manner in which the rear portion of the cluster is supported as it passes onto the platform and the rear support element therefor is released; and

Figure 13 is a schematic view of the drive of the machine.

Referring now to the drawings in detail, it will be seen that there is illustrated a machine which is specifically adapted to receive articles arranged in transverse rows and separated into clusters for wrapping in a wrap film which is preferably formed of plastics material which is heat shrinkable in a shrink oven in a conventional manner. The illustrated machine is specifically constructed to receive cans arranged in two transverse rows of three cans each. It is to be understood, however, that the machine is not so limited. While the machine is primarily intended to receive articles arranged in two transverse rows, the number of articles in each row may vary from one to a much greater number as may be convenient for forming a package of such articles. Further, while the articles have been illustrated as being cans, the articles could be other types of containers including boxes, bottles and jars.

When the articles are of circular cross-section, such as cans or bottles, the articles will be supplied to the machine along a delivery path generally designated by the numeral 10 in Figure 3, and this delivery path is of a width determined by the spacing of side guides 12 so

that the articles will be arranged in columns in nested relation which is the normal relationship assumed when such articles are randomly delivered in a crowded condition. The nested columns of articles are received by an aligning device which is generally identified by the numeral 14. The aligning device includes an endless conveyor 16 which functions as a moving support for the articles and serves to convey the articles from right to left as viewed in Figure 3. Positioned above the conveyor 16 is a guide assembly 18, which guide assembly in the case of three columns of articles defining a straight central path and two outer paths 22. As is clearly evidenced from Figure 3, when the articles move through the guide assembly 18, the articles of the center column move directly along the central path while the articles of the outer column move along the longer outer paths 22. The length of the outer paths 22 is greater than the length of the central path by one-half of an article diameter so that an article A which is to the rear of two transversely adjacent articles A at the entrance to the guide assembly 18 would advance so as to be transversely aligned with those two forward adjacent articles when the three articles exit from the guide assembly 18 as is clearly shown in Figure 3.

It will be seen that the articles exit from the aligning device 14 in transversely aligned rows and are immediately thereafter received by a further mechanism to be described next. It is to be understood that there can be certain slippage of the articles with respect to the conveyor 16 in that it is only natural that the articles push each other along the respective paths.

At this time it is pointed out that while the aligning device 14, as illustrated, will only receive three columns of articles, if there are four columns of articles there will be four paths which are of respective lengths to cause the automatic transverse alignment of

the articles in the same manner as that shown in Figure 3.

The articles pass from the aligning device 14 and are received on support strips 24, there being one support strip for each column of articles. The articles proceed along the support strips 24 and are engaged by an infinitely variable spacing feeder to assure the transverse alignment of the rows of articles. As shown in Figure 1, the feeder 26 includes flight bars 28 having thereon pairs of pins 30 which engage behind the articles and assure the movement thereof along the strips 24 in transverse alignment.

The transversely aligned and columnized articles pass to an infeed conveyor 32 while still supported on the support strips 24. The infeed conveyor 32 includes two conveyor chains 34 which have extending transversely therebetween flight bars 36. Each flight bar 36 has pairs of pins 38 projecting upwardly therefrom with pins of each pair being disposed on opposite sides of a respective one of the support strips 24 for engaging a rear portion of an article in the same manner as do the pins 30 of the flight bars 28. The spacing of the flight bars 36 is such that the articles are moved along the support strips 24 arranged in clusters C of, in the illustrated form of the invention, six articles, the articles being arranged in two transverse rows of three articles each. The infeed conveyor 32 feeds the clusters C to the wrapping station of the machine, the wrapping station being generally identified by the numeral 40.

It is to be understood that each cluster C is to be wrapped with a wrap film supplied from a continuous roll 42 of such film. The film is delivered from the roll 42 by a feed mechanism 44 at a constant rate in accordance

with the predetermined demands of the wrapping station 40. The feed mechanism 44 includes a drive roll 46 and a back-up roll 48. The drive roll 46 is carried by a support 50 and has a fixed axis of rotation. The back-up roll 48 is carried by a pivotally mounted support 52 which is connected to the support 50 by means of a spring 54 so as constantly to urge the back-up roll 48 toward the drive roll 46 and thus form a nip assuring the positive driving and feeding of the wrap film, which film is identified by the numeral 56. The film 56 passes around a pair of idler rolls 58, 60 into the wrapping station 40.

As is clearly shown in the sequence of Figures 1 and 2, a cluster C to be wrapped passes under a portion of the film 56 leading into the wrapping station 40. While the film is held against the top of the cluster, the film behind the cluster is drawn down past the cluster and between that cluster and the next following cluster until the necessary film to form the required wrap has been drawn. The drawn film is then severed as shown in Figure 2b with the result that the cluster C has the wrap W now disposed over the top and down the two sides thereof and the wrap includes a front bottom closure flap 62 and a rear bottom closure flap 64. The flap 64 is preferably of a length no greater than the longitudinal dimension of the article and the flap 62 is of a length approaching the longitudinal dimension of the cluster. This is clearly shown in Figure 2b.

As is shown in Figures 2c and 2d, the flap 64 is folded beneath the rear portion of the cluster and then the cluster is moved onto a supporting platform, generally identified by the numeral 66 which simultaneously folds the front flap 62 beneath the cluster and effects tightening of the wrap W about the cluster to form the completely wrapped cluster of Figure 2g, which wrapped cluster is then delivered to a conventional shrink tunnel (not shown) where the flaps 62, 64 are first heat bonded

together and then the film is heat shrunk in a conventional manner.

Reference is now made to Figure 5 wherein all of the general details of the wrapping station 40 are illustrated. First of all, the wrapping station 40 includes a lower conveyor generally identified by the numeral 68. The lower conveyor 68 includes two transversely aligned chains 70 which carry transversely aligned support plates 72. Each transversely aligned pair of support plates 72 carry a pair of pivotally mounted arms 75, 76 which, in turn, carry a front support element 78 and a rear support element 80.

Referring now to Figure 6 in particular, the specific configuration of the arms 74 and 76 is illustrated. Each arm 74 is pivotally mounted on a pivot 82 carried by the respective support plate 72 and has connected to the outer end thereof the respective transversely extending front support element 78. The inner end of the arm 74 is provided with a cam follower 84 which engages a first cam 86 for positioning the front support elements 78. As shown in Figure 11, associated with the pivot 82 is a spring 88 which constantly urges the arm 74 in a clockwise direction about the pivot 82 to hold the cam follower 84 against the cam 86. Rotation of the arm 74 in a clockwise direction is restricted by a pin 90 extending through a slot 92 in the plate 72.

The arm 76 is of a similar construction and mounting, but is of a different configuration. Each arm 76 is pivotally mounted on a pivot 94 carried by its respective support plate, and is urged to rotate about that pivot in a clockwise direction by a spring 96 as shown in Figure 11. The outer ends of pairs of the arms 76 are joined by the respective rear support elements 80 and the inner end of each arm 76 is provided with a cam follower 98 which engages a cam 100. Each arm 76 also carries a pin 102 which is received in a slot 104 in the

support plate 72 to limit the rotation of the arm by its spring.

The wrapping station 40 also includes an upper conveyor, generally identified by the numeral 106. The upper conveyor 106 includes a pair of transversely spaced and aligned conveyor chains 108 which have extending therebetween sets of retainers, each set of retainers including a front retainer 110 and a rear retainer 112. The front retainers 110 are preferably in the form of angle members and engage upper front corners of the clusters. The rear retainers 112 have resilient pads 114 on the undersides thereof, which pads engage the upper surface of the rear portion of a cluster. The relationship of the retainer 110 and pad 114 with respect to a typical cluster is best shown in Figure 6.

It will be readily apparent from Figure 5 that the lower conveyor 68 and the upper conveyor 106 cooperate fully to support a cluster and to transport the cluster from the infeed conveyor 32 to the supporting platform 66.

The wrapping station 40 also includes a draw unit generally identified by the numeral 116. The draw unit 116 functions both to draw the film 56 down between adjacent clusters and to feed wrapped clusters off of the supporting platform 66. The draw unit 116 also includes a pair of transversely aligned and transversely spaced conveyor chains 118 which are suitably mounted for movement in unison. Extending between the chains 118 are pairs of draw members 120 and 122. The draw member 120 leads the draw member 122 and serves as the primary drawing element to draw the film between adjacent clusters. The draw member 122 cooperates with the draw member 120 when the film is below the predetermined path of movement of the clusters to tension the film to facilitate cutting thereof in a manner to be described hereinafter. The draw member 120 also functions to position wrapped clusters from the supporting platform in a manner also to be described hereinafter.

The wrapping station 40 further includes a spacing device generally identified by the numeral 124. The spacing device 124 also includes a pair of transversely spaced and transversely aligned conveyor chains 126. A plurality of spacing units 128 are carried by the conveyor chains 126. Each spacing unit 128 includes a pair of support plates 130, 132 carried by each of the chains 126. As best shown in Figure 6, each support plate 130 has pivotally mounted thereon an arm 134. Each support plate 132 also has mounted thereon an arm 136. The remote ends of the arms 134, 136 are pivotally joined together to form a scissors arrangement. Extending between the joined together outer ends of the arms 134, 136 is a spacer element 138.

The arm 134 has rigidly secured thereto a further arm 140 which carries a second spacer element 142. The scissors arrangement of the arms 134, 136 permits the conveyor chain 126 to pass around sprockets while the rigid mounting of the arm 140, which supports the spacer element 142, permits the spacing between the support elements 138 and 142 to remain constant.

At this time it is pointed out that the spacing between spacer units 128 is the same as that of the spacing of the elements of the lower conveyor 68 and the upper conveyor 106.

Returning now to Figure 5, it is to be understood that the conveyor chains 70 may be mounted on any suitable sprocket arrangement and all that is required is that the chains 70 include drive sprockets 144 which are carried by a driven shaft 146.

In a like manner, the conveyor chains 108 of the upper conveyor 106 may be supported in any desired sprocket arrangement except that the chains must have a horizontal lower run. The sprockets do include a drive sprocket 148 for each of the chains 108. The drive sprockets 148 are carried by a drive shaft 150.

The spacing device 124 has the conveyor chains 126 thereof mounted on any desired sprocket arrangement which will permit the passage of the spacing units as required, and the only limitation is that the conveyor chains 126 must have a horizontal lower run. In other words, the upper runs of the chains 70 and the lower runs of the chains 108 and 126 must be parallel to one another and to the path of movement of the clusters through the wrapping station 40. The sprockets for the conveyor chains 126 include drive sprockets 152 which are carried by a drive shaft 154.

The mounting of the conveyor chains 118, however, provide a different problem. The general mounting of the chains 118 above the path of movement of the clusters is variable. However, the path of the conveyor chains 118 generally in alignment with the path of movement of the clusters must be controlled as shown in Figure 5. Further, because the spacing of the draw members is greater than the spacing of the elements of the upper and lower conveyors and the spacing device, there must be provided means for absorbing this extra spacing beneath the path of the clusters and this is specifically shown in Figure 7 and will be described in detail hereinafter.

The conveyor chains 118 are, however, driven by drive sprockets 156 which are mounted on a drive shaft 158. It is to be noted that the drive shafts 150, 154 and 158 are disposed adjacent one another.

Referring now to Figure 6, it will be seen that the infeed conveyor 32 and the support strips 24 terminate adjacent a pair of combined support and feed rolls 160, 162. These rolls are driven at the same peripheral speed as the infeed conveyor 32, and as the front articles of a cluster C move thereon, they are fed and supported by the rolls 160, 162. As the front articles of the cluster move off of the roll 160, the associated front support element engages beneath the articles and serves to support and

convey the articles at the same speed as previously fed by the infeed conveyor 32. Then, the rear articles of the cluster pass onto the rolls 160, 162 and out of control of the infeed conveyor 32. The rolls 160, 162 feed the rear articles to the left and before the rear articles pass off of the roll 160, they are engaged by the rear support element 108. Thus, the articles of each cluster C are readily transferred from the infeed conveyor 32 to the lower conveyor 68 in an uninterrupted continuous action.

It will also be seen from Figures 5 and 6 that the front retainer 110 fully engages the front corner of the cluster at the same time as the front articles of the cluster are fully supported by the front support element so as to prevent the forward tipping of the articles. The front retainer 110 loosely engages the film 56 and permits the drawing of the film over the new cluster. At about the time shown in Figure 6, the resilient pad 114 of the rear retainer 112 engages the upper surface of the rear portion of the cluster and serves to clamp the film 56 thereagainst. At this time, the drawing of the film for the preceding cluster has been completed and the resilient pad 114 now serves to hold the film 56 for the drawing thereof to effect wrapping of the new cluster.

At this time the next following draw member 120 has engaged the film 56 rearwardly of the cluster and has started drawing the film down beyond the cluster.

It is to be noted that the spacer elements 138 and 142 follow the draw members 120 and 122 down between the adjacent clusters and the spacer element 142 serves to hold the film against the front of the trailing cluster as is clearly shown in Figure 6.

Referring now to Figures 7 and 8, it will be seen that at this time the associated portions of the conveyor chains 118 are passing under sprockets 164, then over sprockets 116, and under sprockets 168 so as to change the spacing between the draw members 120, 122 of that

particular set of draw members. This results in the tensioning and supporting of the film 56 so that it may be engaged by a hot wire 168 and severed.

The wrapping station 40, of course, includes a frame 170 which may be of any construction and a portion only thereof is shown in Figure 8. The frame 170 includes frame members 172 which have pivotally mounted thereon support arms 174 which are joined together by a transverse connecting arm 176. The connecting arm 176 carries an upper support member 178 which, in turn, carries an inverted yoke 180 including the hot wire 168.

A cam shaft 182 extends transversely of the machine and carries a cam 184. The cam 184 is engaged by a cam follower 186 which, in turn, is carried by the support arm 174 by way of a bracket 188.

The frame 170 also includes frame members 190 having a first transverse rod 192 extending therebetween. A spring 194 extends between the rod 192 and the support member 178 and normally holds the hot wire 168 in a retracted position and the cam follower 186 against the cam 184.

Since the hot wire 168 is always heated, it is necessary to protect against engagement thereof by the film after the film has been cut. To this end there is provided a guard unit 196. The guard unit 196 is carried by a pair of arms 198 pivotally mounted on the rod 192. The arms 198 carry a bracket 200 which supports a cam follower 202 which engages a cam 204 carried by the cam shaft 182.

The guard unit 196 is constantly urged toward a retracted position by means of a spring 206 which extends between a bracket 208 carried by the frame 170 and an arm 210 carried by the bracket 200.

The guard unit 196 includes a shield plate 212 which normally overlies the hot wire 168. Further, a flap 214 extends upwardly from the shield plate 212 to wipe against the depending front flap 62.

After the film 56 has been drawn and severed, the draw members 120, 122 play no part in the wrapping operation, and it is merely necessary to absorb the extra spacing of the draw members by running the conveyor chains 118 over further sprockets 216, 218, 220 and 222, as shown in Figure 7.

The film having been severed and the wrap W now being in the form of a separate piece of film, it is necessary to fold the rear bottom closure flap 64 beneath the rear portion of the cluster, followed by a folding of the front bottom closure flap under both the cluster and the rear bottom closure flap. The rear bottom closure flap is first folded into place in the manner shown in Figures 9 and 10.

The wrapping station includes an auxiliary support 224 which is mounted for movement in an orbital path 226. The auxiliary support 224 extends transversely of the machine and is carried by a pair of upstanding arms 228 each of which is secured to a pair of endless conveyors 230, 232 positioned vertically above one another and having like paths of movement. The conveyor 230 is supported by a pair of sprockets 234, 236 which are driven in unison while the conveyor 232 is supported by a pair of sprockets 238, 240 which are also driven in unison and at the same rate as the sprockets 234, 236.

It is also pointed out at this time that the auxiliary support 224 carries an air nozzle arrangement 242 for directing an air blast generally longitudinally of the path of movement of the clusters and beneath the same.

The auxiliary support 224 moves into position beneath the rear portions of the rear articles of the cluster while the rear support element 80 is still supporting the articles. Once the auxiliary support 224 is in the required supporting position, the rear support element 80 retracts as shown in Figure 10. This is caused by the

cam followers 98 engaging the recesses 244 in the cams 100. This assures the arms 76 being pivoted in a clockwise direction by the springs 96.

The rear support element 80 having moved away from the underside of the cluster, the rear bottom closure flap 64 is now free to be blown beneath the rear articles of the cluster and this is accomplished by the air nozzle arrangement 212. After sufficient time has elapsed for the blowing of the flap 64 into place, the cam followers 90 ride up onto the surface of the cams 110 with the result that the rear support element now swings back into place as shown to the left in Figure 10, clamping the rear bottom closure flap 64 against the underside of the rear of the cluster C.

It is to be understood that the air nozzle arrangement is operated only for a short period of time and is controlled by a valve arrangement to be described hereinafter.

Referring now to Figure 11, it will be seen that the cluster, with the flap 64 in place, now approaches the supporting platform 66. At this time it is pointed out that the supporting platform is formed by a pair of transversely extending rods 248 which are fixed against rotation and which are of a slightly lesser diameter than the rollers 246 so that the leading portion of the platform 66 has a step.

As the front portion of the cluster C moves up onto the rods 248, the front flap 62 is folded beneath the front portion of the cluster. As the front portion of the cluster progresses onto the platform 66, the front support element 78 retracts, as is clearly shown in Figure 11, due to the cam followers 84 going down ramp portions 250 of the cams 86. The springs 88 cause pivoting of the arms 74 to effect this retraction.

When the cluster is in the position illustrated in Figure 11, it is still being stabilized by the front

spacer element 138 and is supported by the rear support element 80. It is also stabilized by the resilient pad 114. However, the front retainer 110 has begun to disengage.

As the cluster continues to move to the left, the front flap 62 is continued to be folded beneath the cluster. Shortly before the rear flap 64 approaches the first rod 248, an air blast from an air nozzle tube 252 is directed against the underside of the flap 64 and holds it tightly against the underside of the cluster. Due to the step arrangement of the leading edge of the platform 66, the leading edge of the flap 64 passes up over the adjacent portion of the flap 62 and over the leading rod 248, as shown in Figure 12.

When the leading portions of the rear articles of the cluster become supported by the leading rod 248, as shown in Figure 12, the rear support element 80 may now be retracted since tipping of the rear articles of the cluster is prevented by the spacer element 138.

The spacer element 138 now becomes substantially the sole means for advancing the cluster. As the cluster advances onto the supporting platform 66, the resilient pad 114 moves out of engagement with the top of the cluster and the cluster is supported solely by the supporting platform 66. As the spacer element 138 pushes the cluster along the supporting platform, the front flap 62 is folded completely beneath the cluster and at the same time, due to the frictional resistance against movement of the flap 62 over the first rods 248, the wrap W is drawn tightly around the cluster C to form a tight package.

At this point, the spacing unit 128 begins to elevate and at the same time the related draw member 120 moves around a sprocket 396 into engagement with the lower rear portion of the wrapped cluster, as shown in Figure 7. The draw member 120 now takes over the responsibility of discharging the wrapped cluster off of the supporting

platform 66 and moving the same onto a discharge conveyor 254 which is a part of a shrink tunnel (not shown). The discharge conveyor 254 may be of any construction and includes drive sprockets 256 carried by a drive shaft 258. The operation of the wrapping station is now completed.

It is also to be noted at this time that since the spacing of the draw members 120 is greater than the spacing of the spacer elements 138, the wrapped cluster is advanced more rapidly and away from the following cluster which has not had the wrapping thereof completed. Thus, there is an increase in spacing of the clusters delivered to the shrink tunnel over that of the spacing of the clusters in the wrapping station.

Referring once again to Figure 1, it will be seen that the conveyor chains 34 of the infeed conveyor 32 extend around a suitable pattern of sprockets which include drive sprockets 260, carried by a drive shaft 262. The top run of the infeed conveyor 32 is the only effective run, and the path of movement of the top runs are controlled by guide bars 264, as shown in Figure 6. In a like manner, the paths of conveyor chains 108 above the paths of movement of the clusters are controlled by sets of guide bars 266. Further, the paths of movement of the lower runs of the conveyor chains 126 above the path of movement of the clusters are controlled by guide bars 268.

As far as this invention is concerned, the point of drive of the machine is immaterial. However, for descriptive purposes and as is shown in Figure 13, the discharge conveyor 254, which leads into the shrink tunnel, may be considered to be the source of drive, and the shaft 258 thereof carries a sprocket 270 which is coupled to a sprocket 272 carried by a transverse shaft 274 by a chain 276. On the near side of the wrapping station 40 the shaft 274 carries a sprocket 278 with which there is meshed a chain 280. The chain 280 drives a sprocket 282 carried by the drive shaft 158. A chain 284 extends from

another sprocket (not shown) on the shaft 158 to a sprocket 286 carried by the drive shaft 154 to drive the drive shaft 154. The drive shaft 154 carries a sprocket 288 which drives a sprocket 290 on the drive shaft 150 by means of a chain 292. This completes the drive for the upper part of the wrapping station. It is pointed out here, however, that the relative sizes of sprockets have been varied only for purposes of illustration and the sprockets 148 and 152 are to rotate at the same rate when they are the same diameter and the sprocket 156 is to rotate at a higher speed because of the greater rate of travel of the conveyor chain 118.

On the near side of the machine, the drive shaft 146 is driven from the drive shaft 274 by a sprocket 292 on the shaft 274 and a sprocket 294 on the shaft 146, the sprockets 292 and 294 being interconnected by a chain 296. At this time it is pointed out that the conveyor chain 70 must be driven at the same rate as the conveyor chains 108 and 126.

The drive shaft 274 also drives a drive shaft 298 by a drive which is mounted on the near side of the machine. To this end the drive shaft 274 has a sprocket 300 driving by way of a chain 302 a sprocket 304 carried by the shaft 298. The drive shaft 298 provides the drive for the rear of the machine.

Most specifically, the drive shaft 298 by means of sprockets 306 and 308 and a chain 310 drives a speed reducer 312. The speed reducer 312 has an output shaft 314 carrying a sprocket 316 driving a chain 318 which, in turn, drives a sprocket 320 carried by a shaft 322 on which the drive roll 45 is mounted. In this manner, the film 56 is delivered from the roll 42 at the same rate as is required in the wrapping of the clusters. The speed reducer 312 is variable for this purpose.

The drive shaft 298 also carries a sprocket 324 which drives a sprocket 326 through a chain 328. The sprocket 326 drives a sprocket 330 of the toothed belt type

and by way of a belt 332 drives a sprocket 334 coupled to the support and feed roll 160 for driving the same. This drive is also on the far side of the machine.

On the near side of the machine the support and feed roll 162 drives the support and feed roll 160 by means of a toothed belt and sprocket drive arrangement 336.

The drive shaft 298 drives a further shaft 338 by means of sprockets 340, 342 and a chain 344. If desired, the shaft 338 may be that element which has been previously described as the rod 192.

The shafts 338 and 262 have suitable sprockets thereon connected by a chain 246 for driving the infeed conveyor 32. Incidentally, an idler sprocket of the infeed conveyor 32 may be carried by the shaft 298.

The shaft 338 also drives the cam shaft 182 by means of sprockets 348 and 350 and chain 352.

Finally, the drive of the auxiliary support 224 is driven from the shaft 338. At each side of the machine there is a shaft 354 which is driven from the shaft 338 by means of the sprockets 356, 358 and a chain 360. The shaft 354 carries the sprocket 238. The sprockets 234, 236 and 240 are carried by shafts 362, 354 and 366, respectively. The shafts 354, 362, 364 and 366 carry sprockets 368, 370, 372 and 374, respectively, all lying in a single plane and interconnected by an encircling chain 376.

The infeed conveyor 32 has for each chain thereof an idler sprocket 378 carried by a shaft 380, and the shaft 380 serves as a drive for the feeder 26 by way of sprockets 382, 384 and chain 386.

It is to be understood that the conveyor 16 may be suitably dirven in any manner, either by a separate drive or from the drive of Figure 13, including the drive shaft 380. To this end, as shown in Figure 4, the conveyor 16 includes a drive drum 338 mounted on a drive shaft 390 carrying a sprocket 392 driven by a chain 394.

Referring once again to Figure 13, it will be seen that the cam shaft 182 is provided with two further

cams 398 and 400. The cam 398 is associated with a valve 402 which controls the supply of air under pressure from air line 404 to an air line 406 leading to the nozzle 242.

There is also a valve 408 which controls the flow of air from the air line 404 to the air line 410 leading to the air nozzle tube 252.

It will be seen from the shape of the cams 398, 400 that air is supplied to the respective nozzles only at certain times in timed relation to the movement of a partially wrapped cluster relative to the respective nozzles. The timing has been described hereinabove.

Although the illustrated machine is particularly adapted for wrapping articles (cans) of a predetermined height, it will be readily apparent that by suitably elevating the upper conveyor 106 and possibly the spacing device 124, the wrapping station 40 may be adapted to the wrapping of like clusters but wherein the articles forming the clusters are of a different height.

Although only a preferred embodiment of the machine has been specifically illustrated and described herein, it is to be understood that minor variations may be made in the machine without departing from the spirit and scope of the invention as defined in the appended claims.

CLAIMS:

1. Apparatus for supplying articles of a circular cross-section in longitudinally moving transversely aligned rows, characterised in that said apparatus includes means (10) for arranging the articles in internested columns wherein transversely adjacent articles are longitudinally offset, and an aligning device (14) for moving adjacent articles into transverse rows, said aligning device including guide means (18) defining a separate path (22) for each column of articles, said paths varying in length in accordance with the longitudinal offsetting of the transversely adjacent articles when internested.

2. Apparatus as claimed in Claim 1 wherein single conveyor means (16) is provided underlying all of said paths for advancing adjacent articles at different rates.

3. Apparatus as claimed in Claim 1 or 2 wherein the articles are arranged in three columns and said paths (22) include a central straight line path and two outer arcuate paths.

4. Apparatus as claimed in any of claims 1 to 3 further for forming packages by wrapping clusters of articles with a surrounding wrap including front and rear bottom flaps, comprising a conveyor (68) for conveying clusters of articles along a predetermined path during the application of wraps thereto, said conveyor including plural sets of support

elements carried by a common endless carrier (70), each set of support elements including separately mounted front and rear support elements (78, 80) positioned for supporting front and rear portions of clusters, said front support element (78) being mounted on said common carrier for directly engaging articles only, and means (96, 244) for controlling the movement of said rear support elements relative to said common carrier temporarily to move away from an associated cluster to permit the positioning of a rear flap of the wrap to be engaged with the underside of the rear portion of each cluster and above the respective rear support element.

5. Apparatus as claimed in Claim 4 wherein an auxiliary support (224) is provided movable to a cluster supporting position rearwardly of each rear support element (80) at a predetermined point along said path.

6. Apparatus as claimed in Claim 8 wherein means (228, 230, 232) mount said auxiliary support (224) for movement along said path for drawing the rear flap forwardly under an associated cluster.

7. Apparatus as claimed in Claim 5 or 6 wherein said auxiliary support (224) has associated therewith air blast means (242) for blowing the rear flap forwardly under the cluster for engagement by the respective rear support element.

8. Apparatus as claimed in any of Claims 4 to 7 wherein there is a platform (66) for receiving wrapped clusters, said front support elements (78) being mounted for disengagement with a cluster at a time when the front portion of the cluster is supported by said platform, and said platform in association with the movement of the cluster along said path forming means for drawing a front flap of the wrap rearwardly both to complete the wrap and to tighten the same about the cluster.

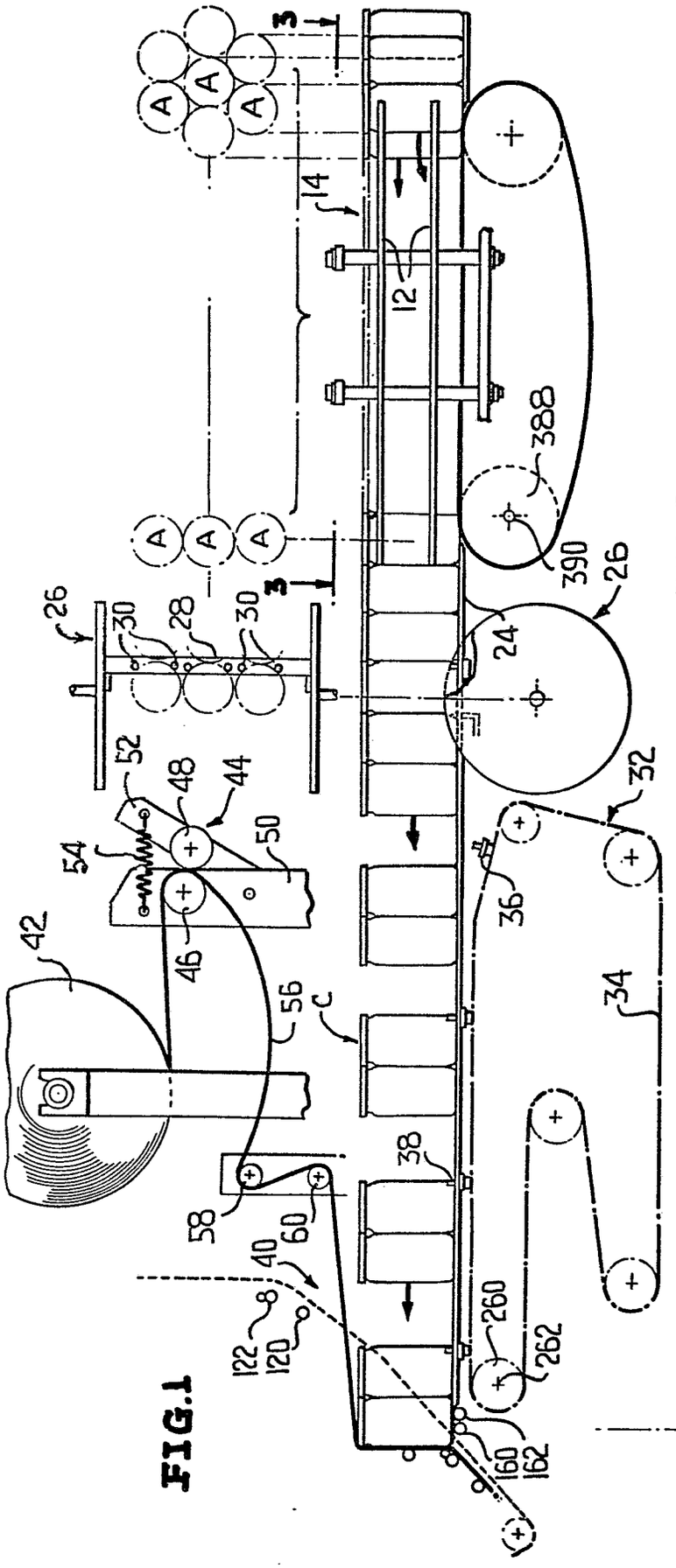


FIG.1

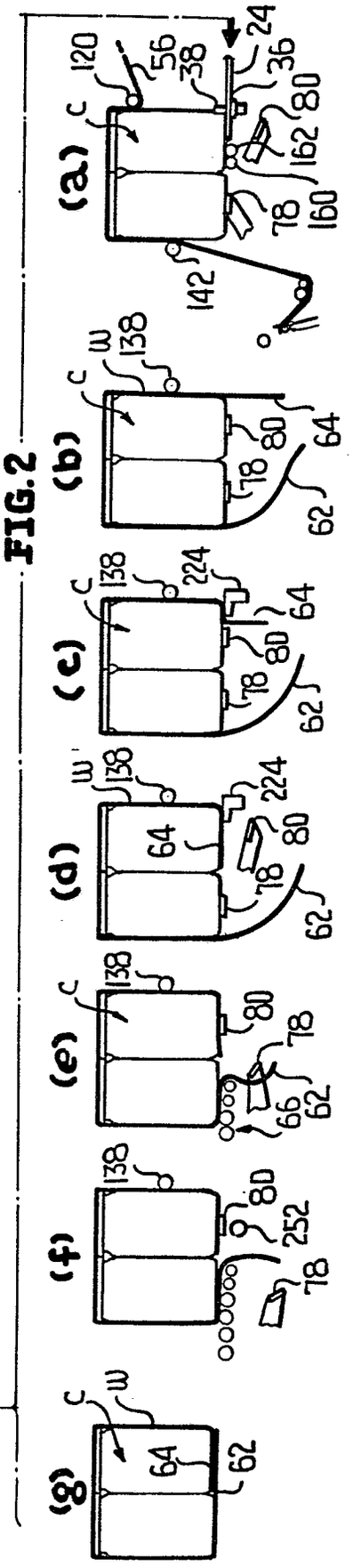
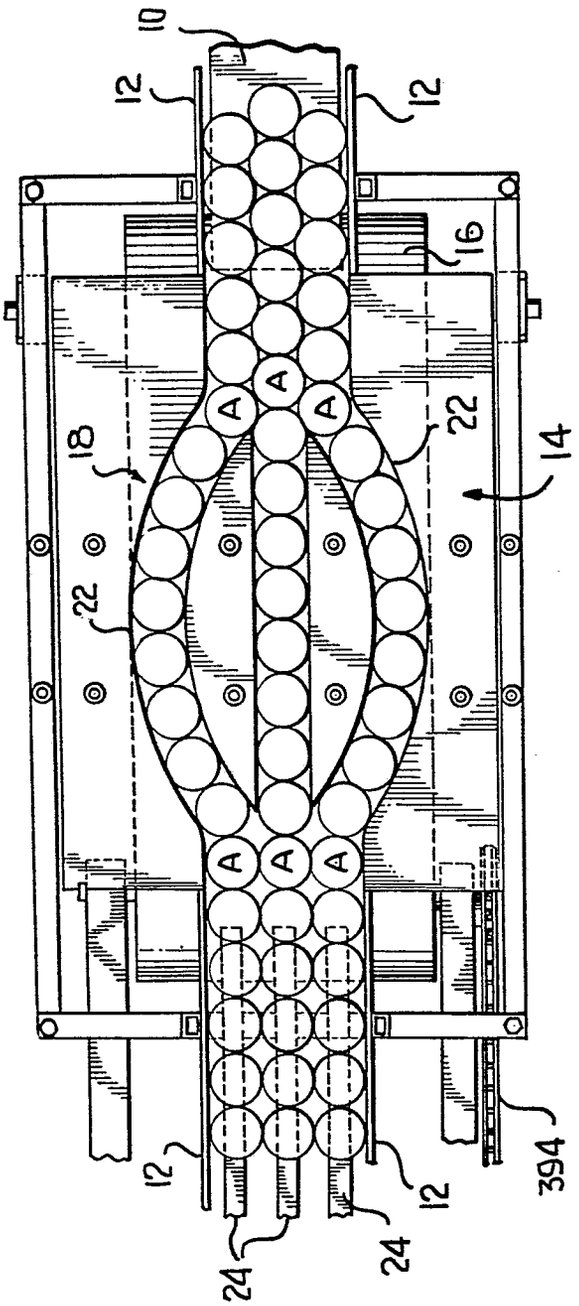


FIG.2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A
A
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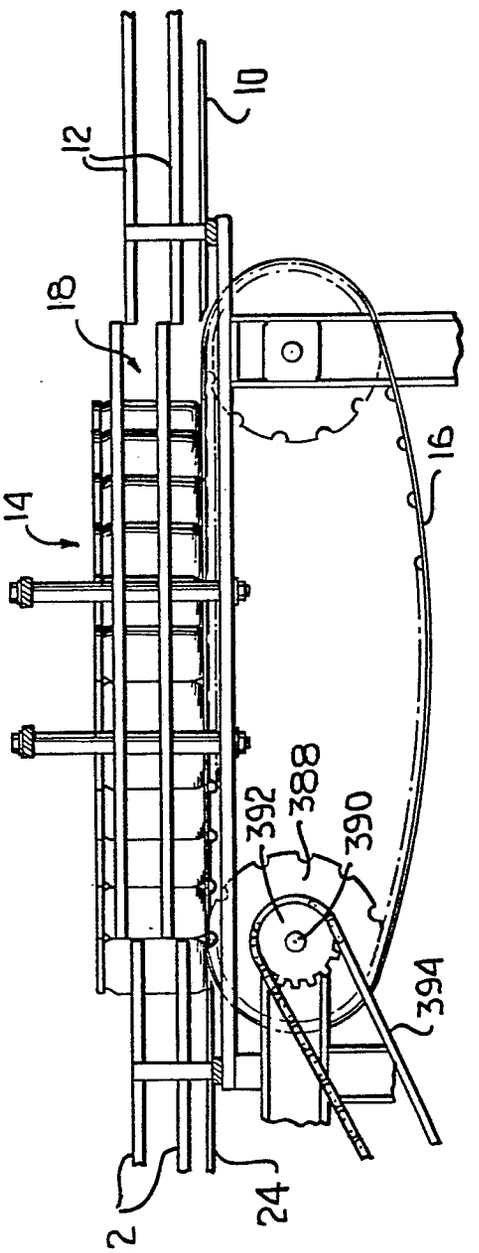
394

FIG.3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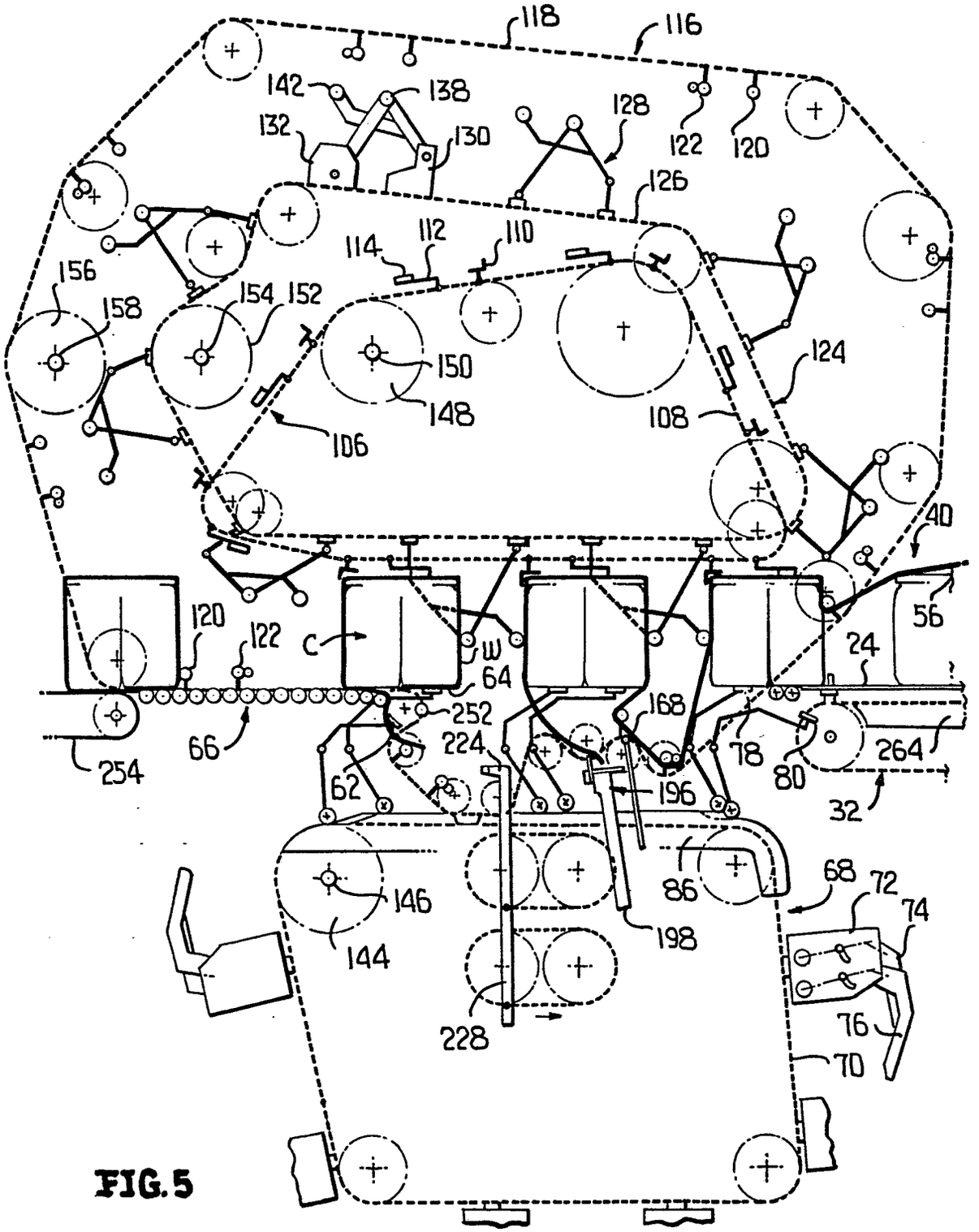
24

FIG.4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108
106
40
120
122
C
W
64
56
24
252
168
66
254
224
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80
264
32
196
146
144
86
68
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228
76
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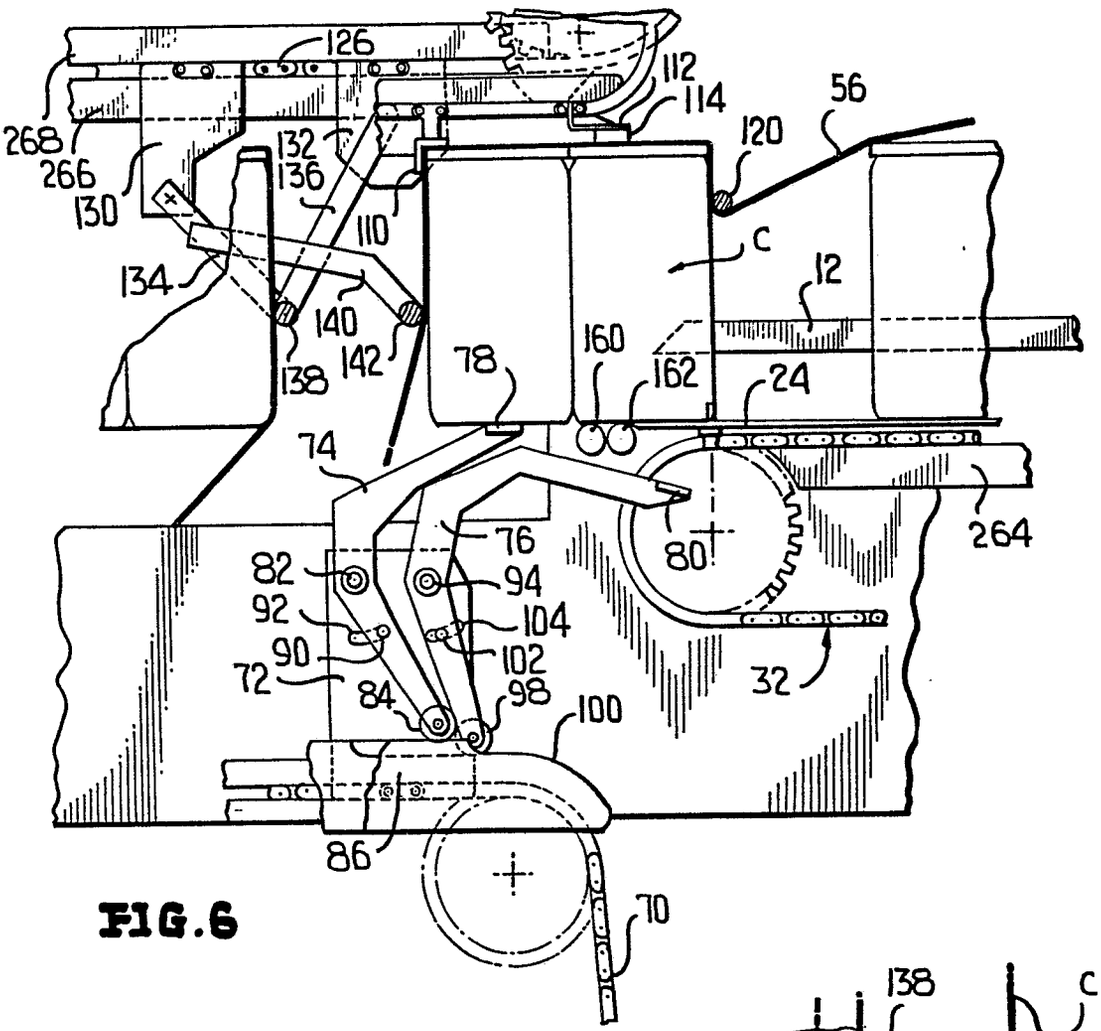
FIG.5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C
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84
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100
32
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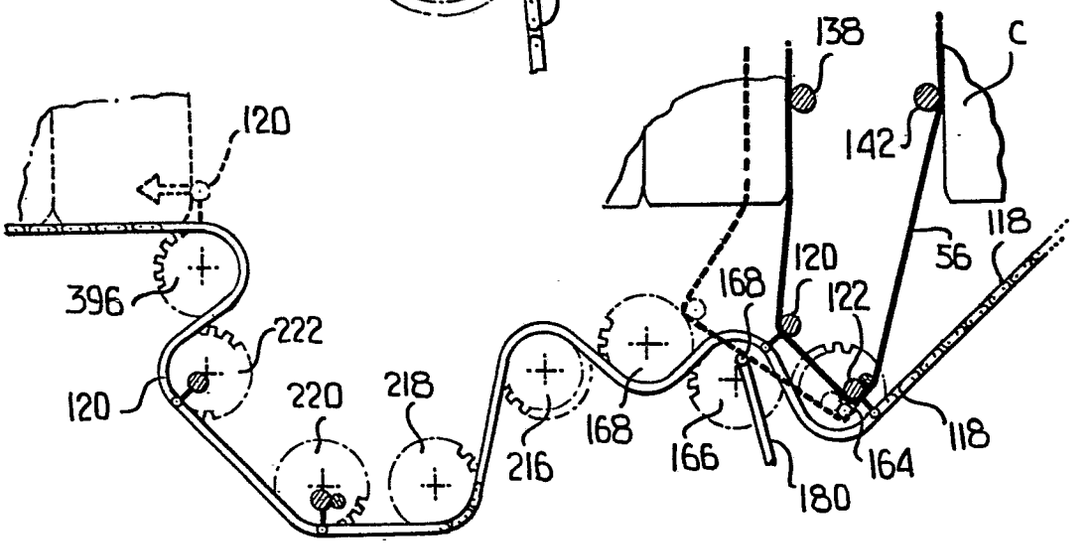
FIG.6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180

FIG.7

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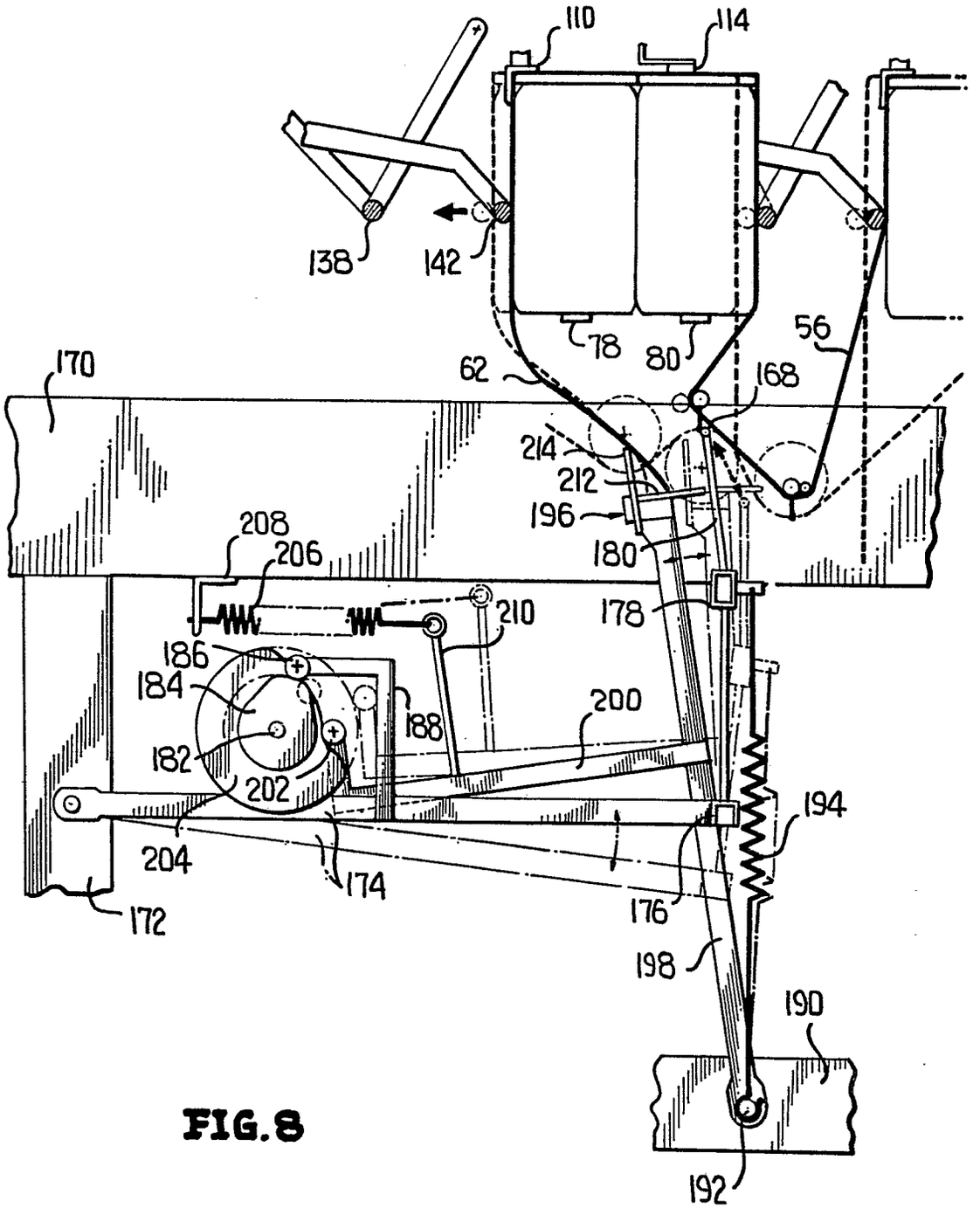
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FIG.8

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FIG.9

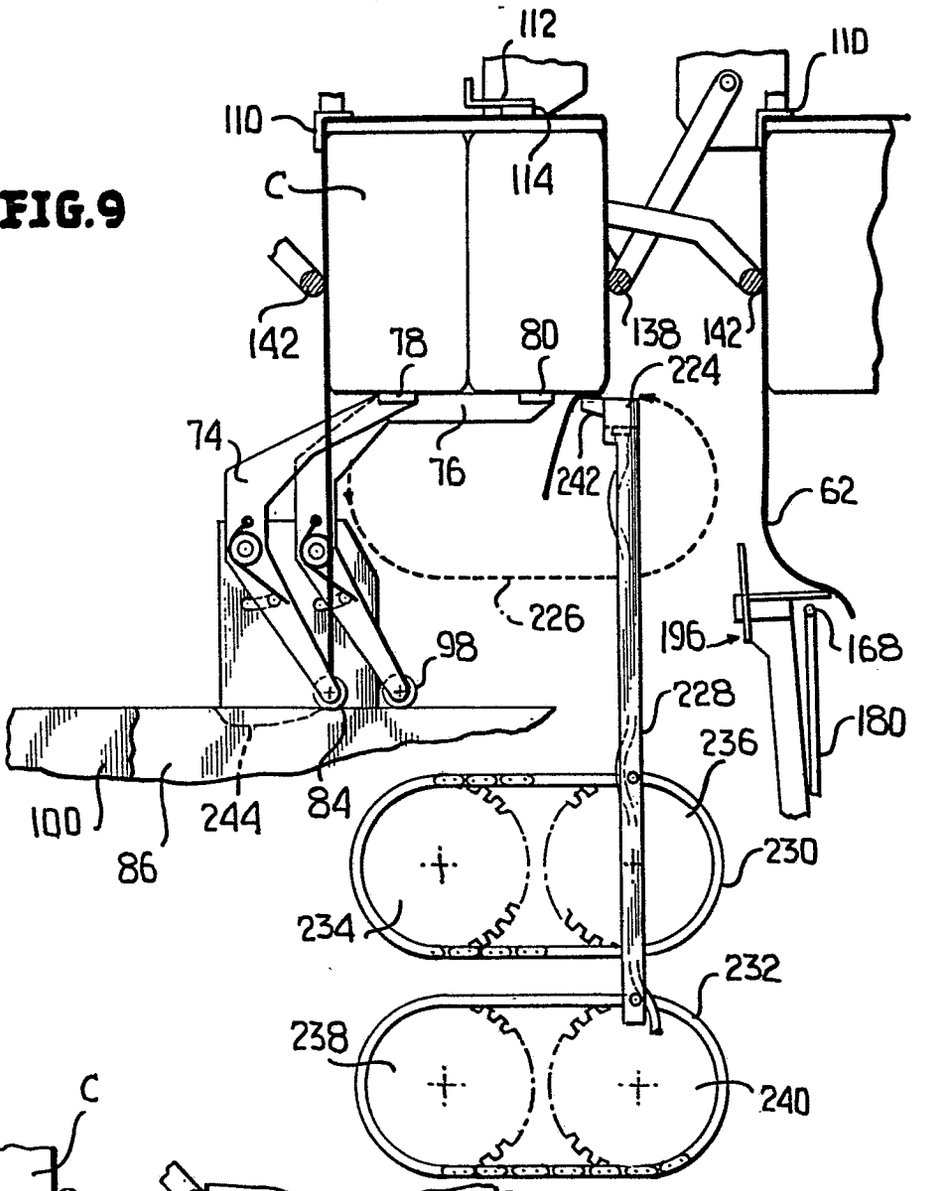
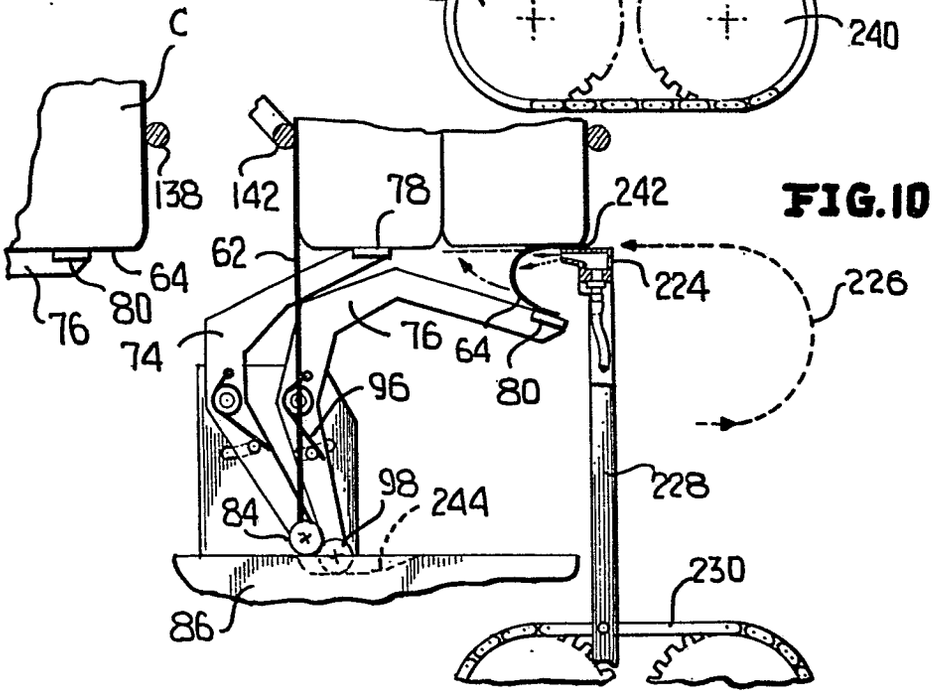


FIG.10



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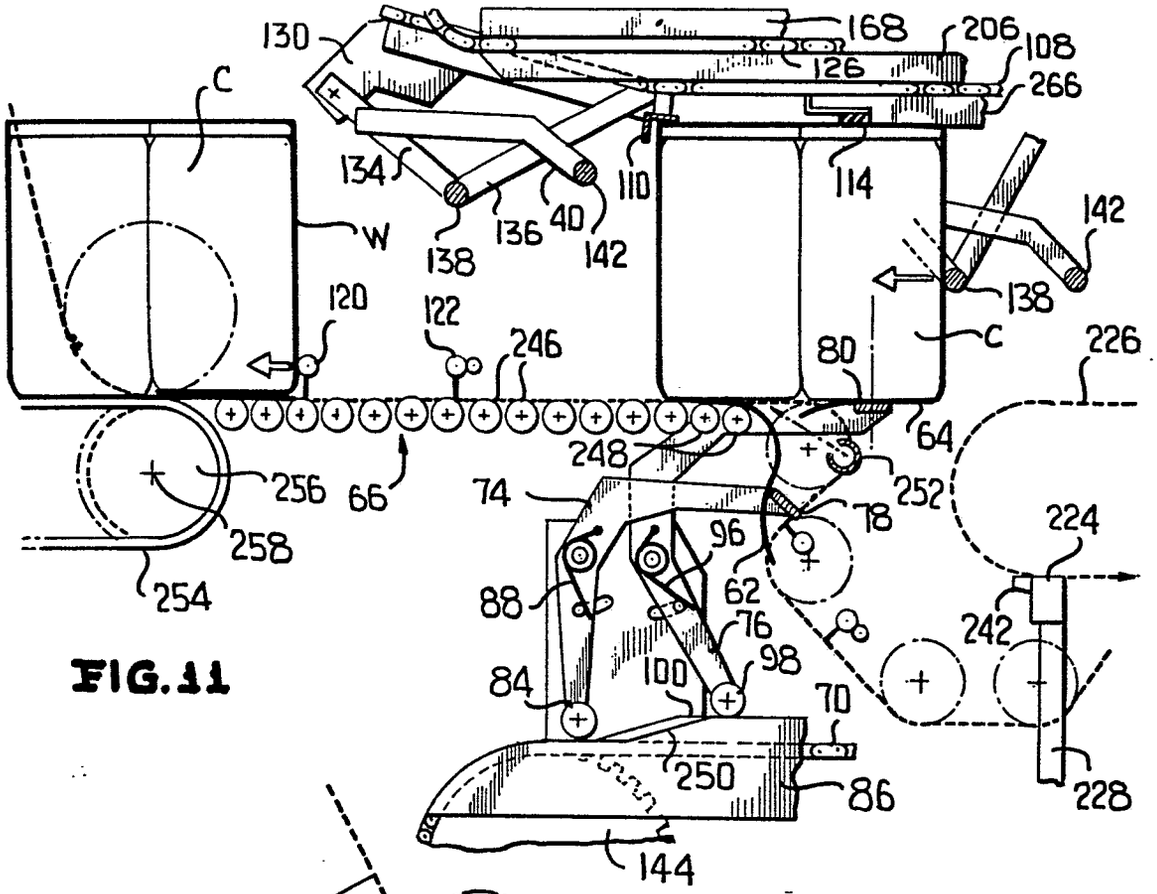


FIG. 11

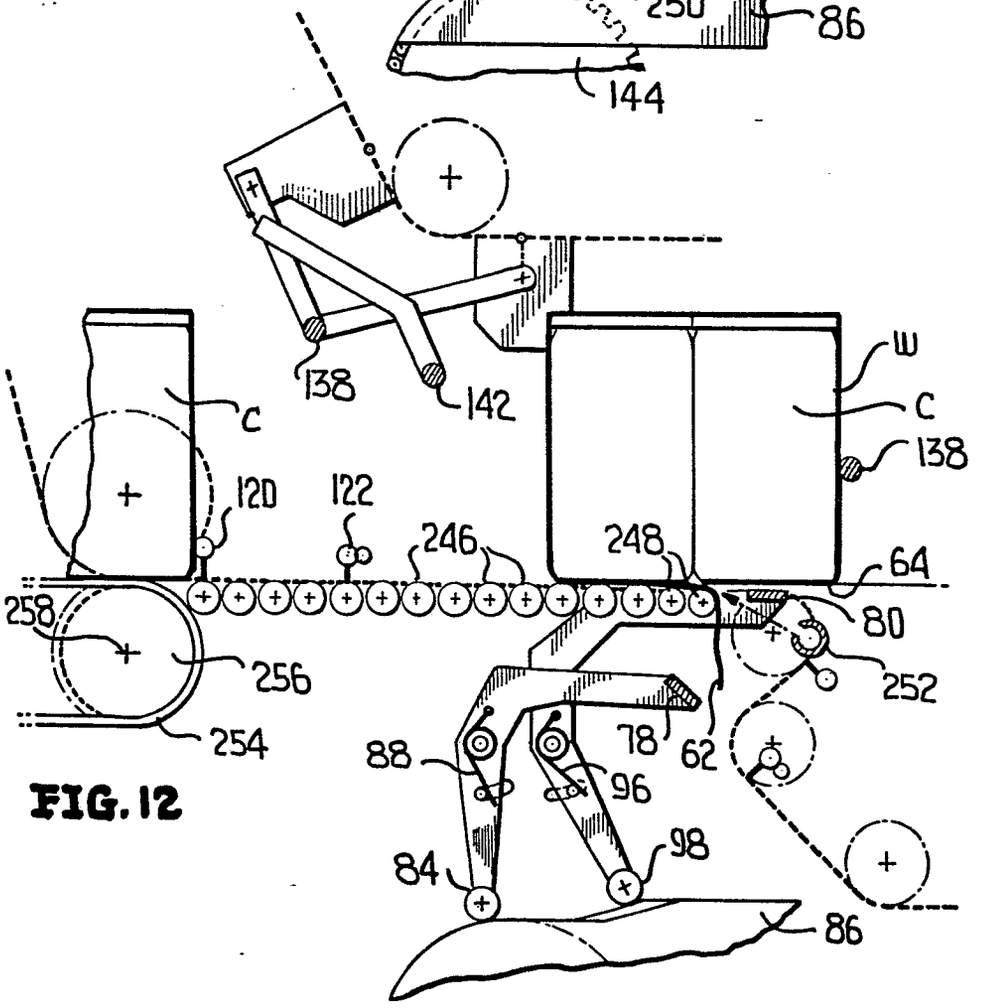
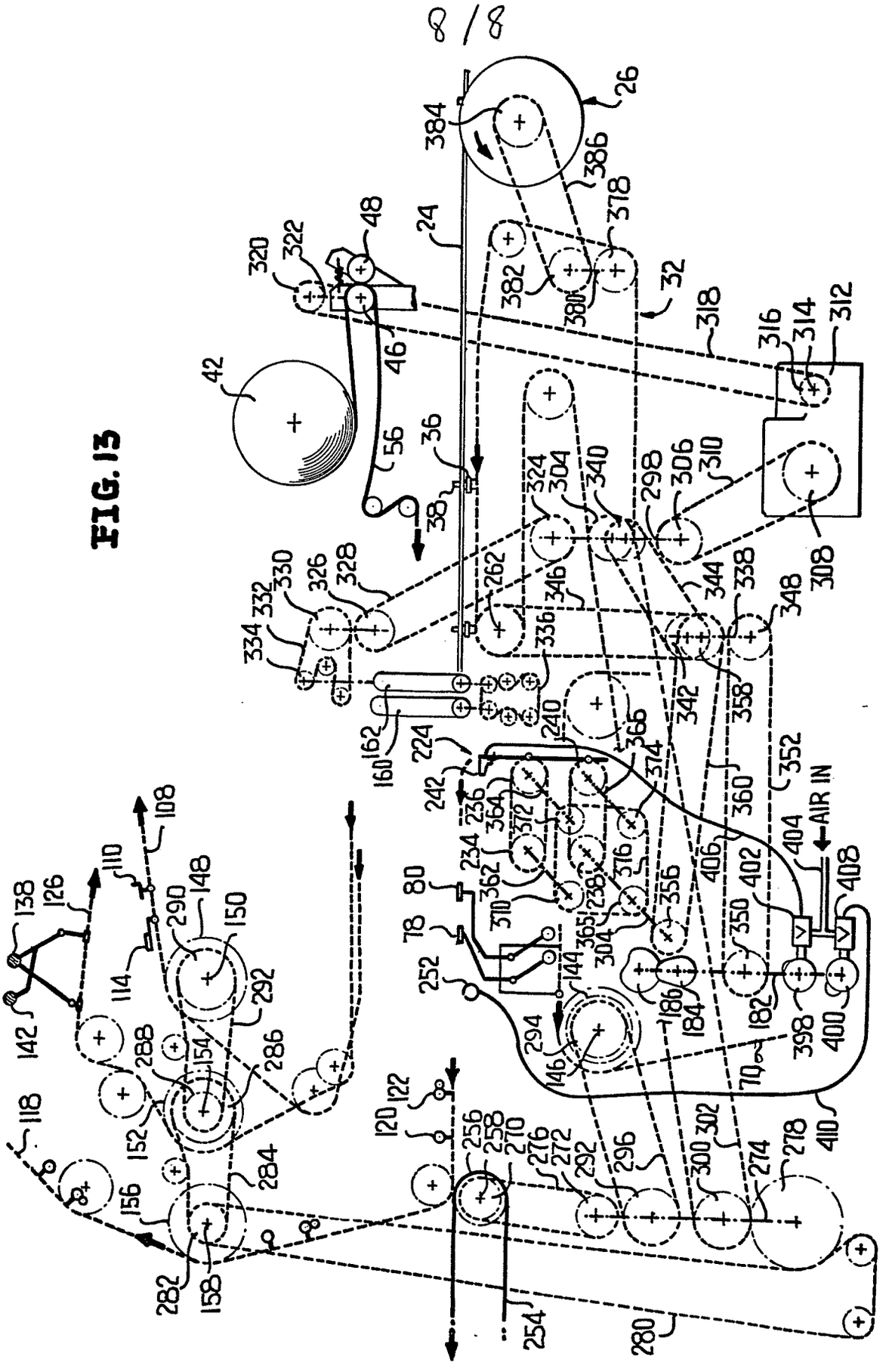


FIG. 12

FIG. 13



European Patent Office

EUROPEAN SEARCH REPORT

Application number EP 81 10 7023

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
D	US - E - 28 535 (GANZ) * column 5, line 50 to column 7, line 49; figure 3 *	1
	US - A - 3 481 107 (ANDBLAD) * column 2, line 43 to column 3, line 28; figures 1 and 2 *	1,2

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

B 65 G 47/28
B 65 B 11/10

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

B 65 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	07.01.1982	CLAEYS