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3,302,946

ROTARY COUPON PLACER

Filed Sept. 11, 1964

3 Sheets-Sheet 1

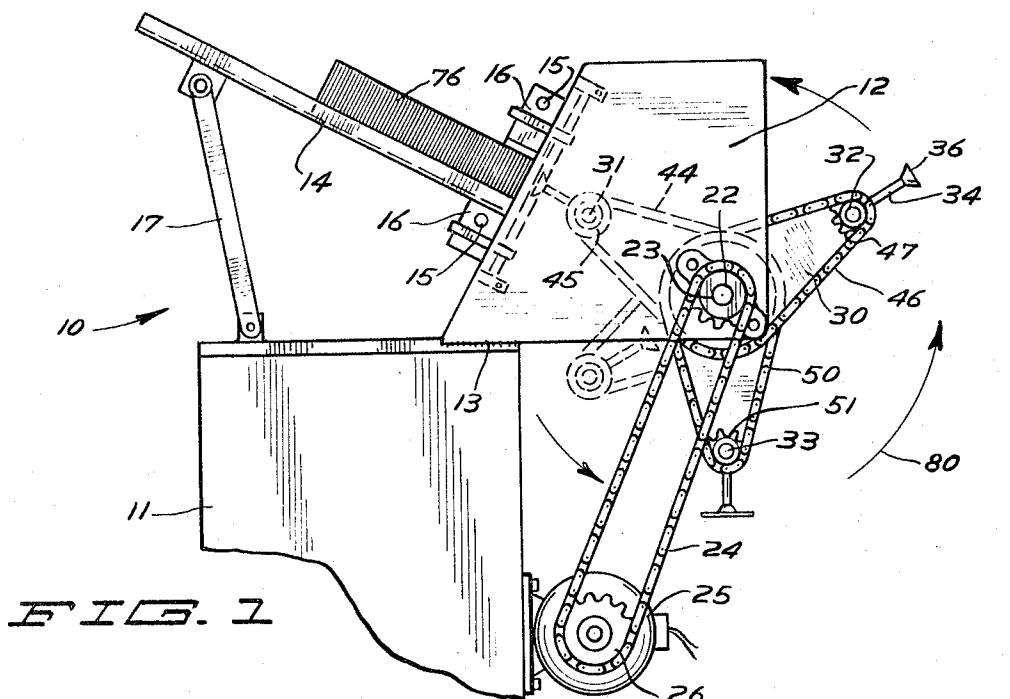


FIG. 1

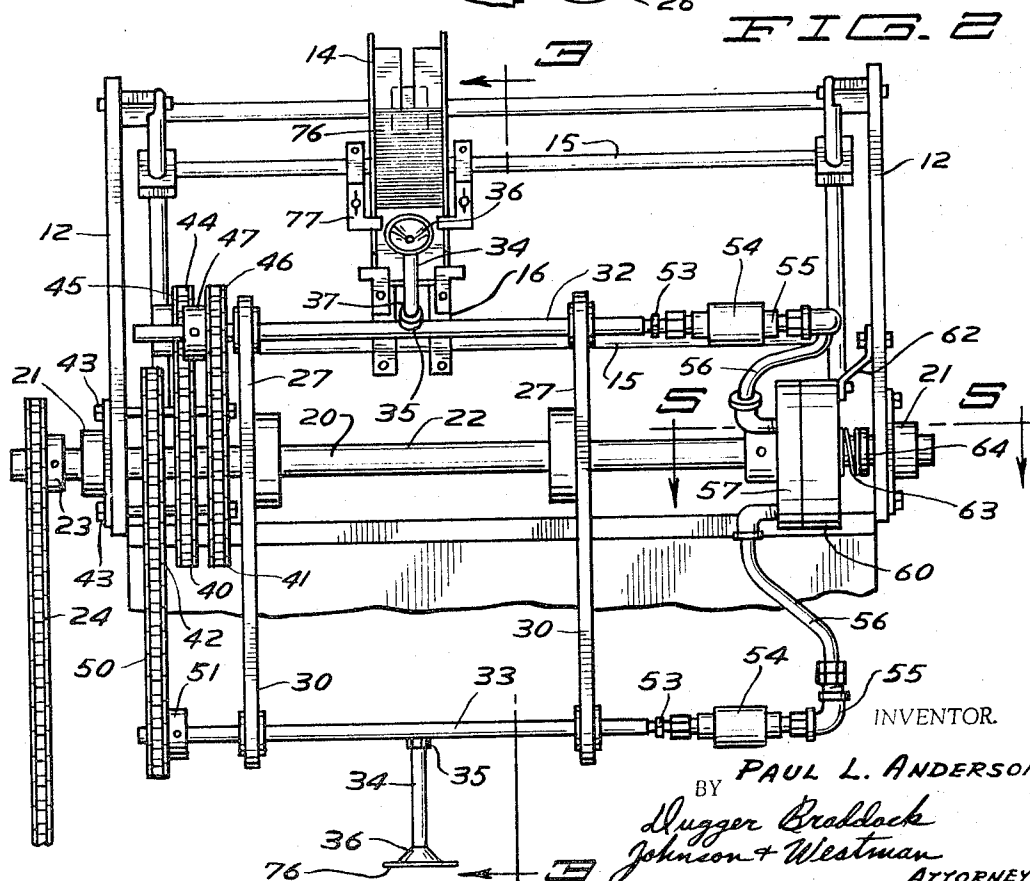


FIG. 2

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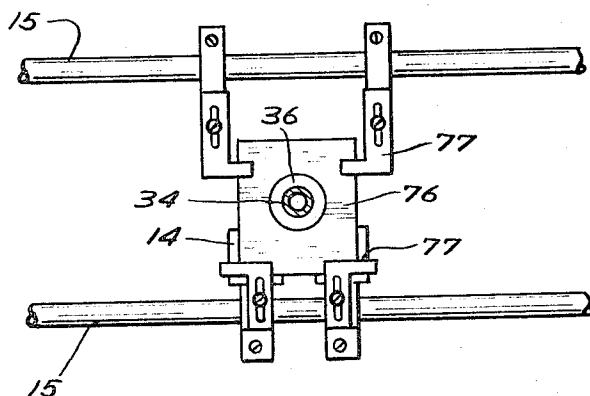
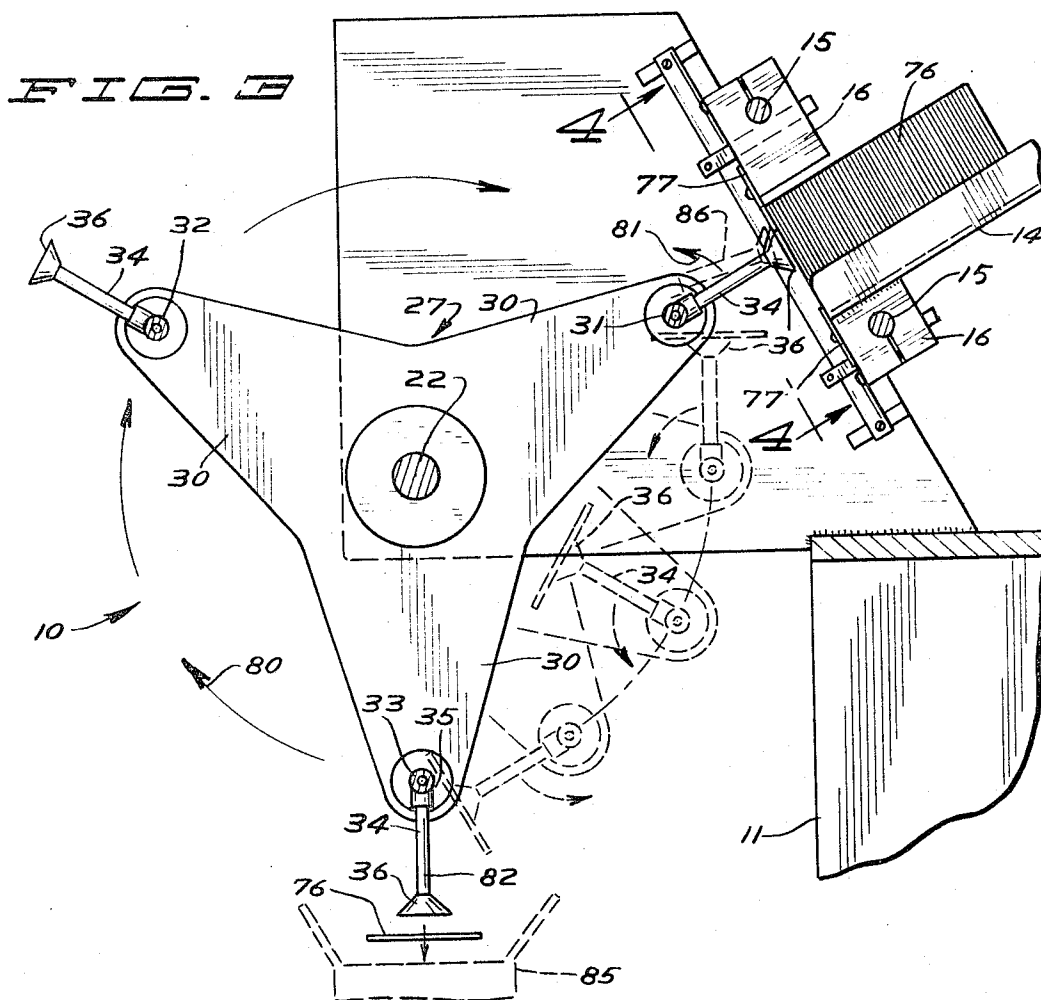
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3 Sheets-Sheet 2



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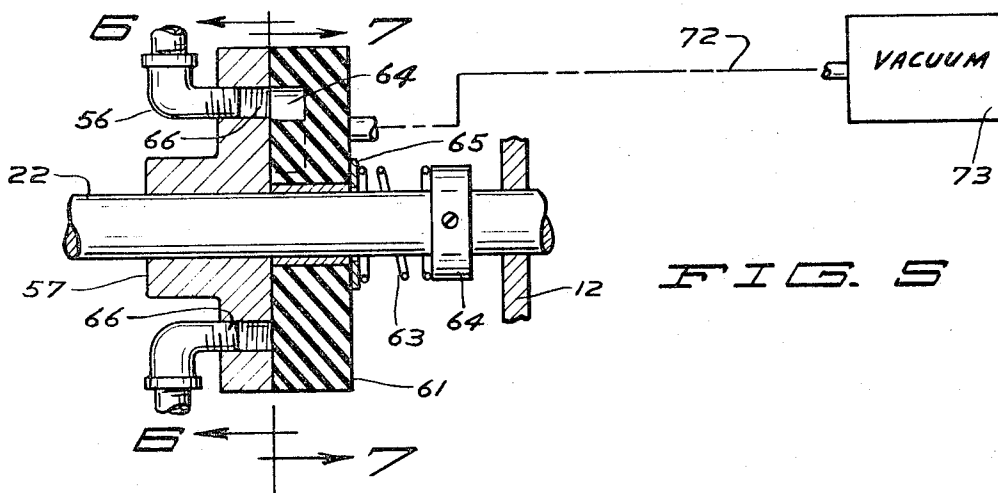


FIG. 5

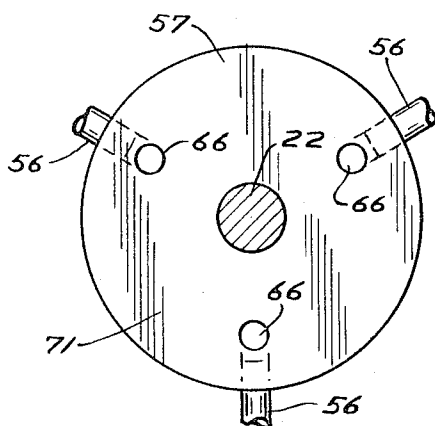


FIG. 6

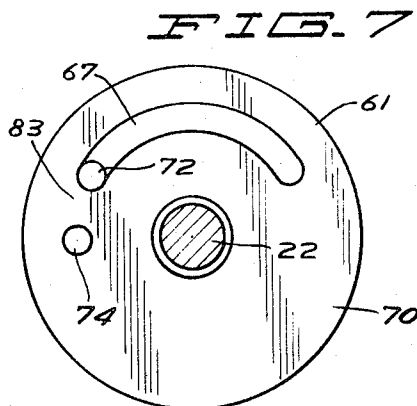


FIG. 7

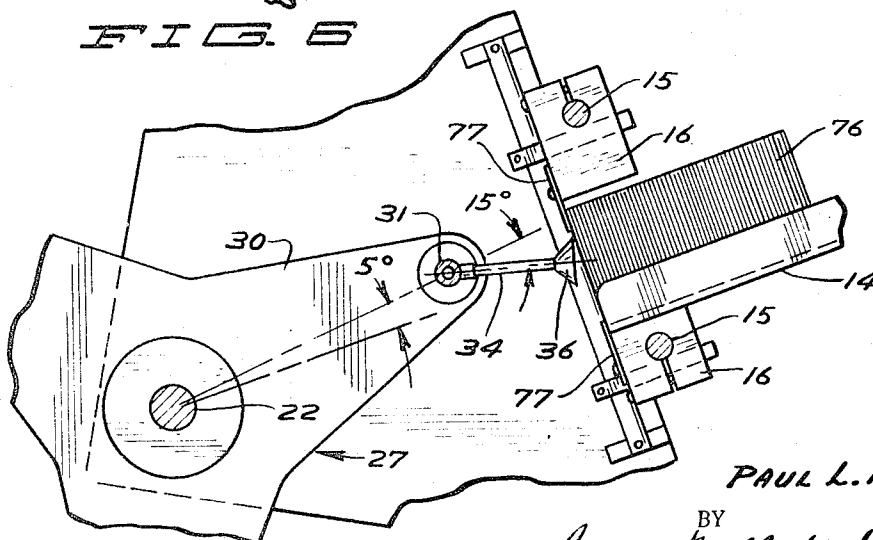


FIG. 8

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ROTARY COUPON PLACER

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5 Claims. (Cl. 271-29)

The present invention has relation to a rotary coupon placer and more particularly to a machine which will take individual coupons or slips of paper from a supply source and deposit the individual coupons into an open carton passing in proximity to the machine.

In the field of automatic packaging, it has long been a problem to place individual coupons, which may be part of promotional schemes by the manufacturer of the product or a redemption coupon of some type, into cartons as rapidly as the cartons or packages themselves can be filled.

Many of the coupons are extremely light in weight and this makes them difficult to handle. The primary problem is to place only one coupon in each package. Further, synchronization of the packages, which are usually filled or packed in an automatic process, is difficult. Hand placing the coupons into the packages is expensive.

In order to overcome the previous difficulties involved in placing individual coupons into a package on an assembly line, the machine of the present invention was advanced.

The machine, as shown, includes a rotating member carrying at least one suction cup which is moved into position contiguous with the end coupon of a supply of coupons in a small hopper. Vacuum is applied to the cup and the cup picks the coupon out of the supply hopper, and as the machine continues to rotate, this coupon is carried into position above an opened package. In this proper position above the open package the vacuum to the cup holding the coupon is released and the coupon is dropped into the package.

The vacuum cups are made so that they will exert a force in the end coupon substantially axially with the hopper to insure that only one coupon is removed at a time, and that a coupon is removed every time.

The device is relatively inexpensive to manufacture and is extremely accurate. Further, the unit is fast and can place coupons in packages at a speed equal to or greater than that of any packaging machine.

It is an object of the present invention to present a coupon placer which can be used for placing individual coupons into open packages coming from an assembly line packaging or filling operation.

It is a further object of the present invention to present a rotary coupon placer which can be operated at high speed.

It is a still further object of the present invention to present a rotary coupon placer which utilizes a vacuum force for removing coupons from a supply hopper and releases the vacuum when the coupon is in its proper position for deposition into an open carton.

Other objects are inherent in this specification and will be apparent as the description proceeds.

In the drawings,

FIG. 1 is a side elevational view of a rotary coupon placer made according to the present invention;

FIG. 2 is a fragmentary enlarged front elevational view of the device of FIG. 1;

FIG. 3 is a sectional view taken as on line 3-3 in FIG. 2;

FIG. 4 is a view taken as on line 4-4 in FIG. 3 and showing a suction cup in place on an end coupon in a coupon hopper;

FIG. 5 is a sectional view taken as on line 5-5 in FIG. 2;

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FIG. 6 is a sectional view taken as on line 6-6 in FIG. 5;

FIG. 7 is a sectional view taken as on line 7-7 in FIG. 5; and

FIG. 8 is a sectional view of the device of FIG. 1 shown just before the suction cup contacts a coupon in a hopper.

Referring to the drawings and the numerals of reference thereon, a rotary coupon placing machine illustrated generally at 10, includes a base member 11 for mounting the various components. The base 11 carries a pair of spaced apart side plates 12, 12 which are fixedly attached as at 13 to the base member 11. In addition, the base member 11 supports a coupon supply hopper 14 which is supported with a strap 17 at the rear portions thereof and is supported on a pair of cross members 15, 15 which are comprised as shafts extending between the side plates 12, 12. Suitable mounting blocks 16 are utilized for mounting the front or forward portion of the hopper 14 onto the cross shafts 15.

A main drive shaft assembly 20 is rotatably mounted on suitable bearings 21, 21 attached to the side plates 12, 12. The shaft assembly 20 extends between the side plates. The shaft assembly 20 includes a drive shaft 22 which is driven through a sprocket 23 and chain 24 from a motor 25 which has a drive sprocket 26 on the output shaft thereof. The motor 25 is mounted onto the base 11. In addition, a pair of spider members 27, 27 are drivably mounted onto shaft 22 in longitudinally spaced locations and positioned between the side plates 12, 12. The spider members, as shown, have three outwardly extending legs 30. The number of legs could, of course be increased or decreased as desired.

At the outer ends of each of the legs 30 of the spiders 27 (the legs of the spiders are spaced longitudinally on shaft 22) a separate tubular shaft 31, 32 and 33, respectively is rotatably mounted. The shafts are all radially spaced from the center of rotation of shaft 22 an equal amount. Each of the tubular shafts 31, 32 and 33 carries a separate radially extending tube 34. The tubes 34 are mounted on suitable collars 35 so that each tube 34 is open to the interior of the shaft on which it is mounted and is sealed from the atmosphere. At the outer end of each of the tubes 34 there is a suction cup 36 mounted. Each cup 36 has an open center portion which opens to the interior of the tube 34 on which it is mounted. The cups 36 are made of a suitable flexible material, such as a soft rubber or a suitable plastic material.

The tubes 34, collars 35 and cups 36 together make a suction cup assembly 37.

As can perhaps best be seen in FIG. 2, three sprockets 40, 41 and 42, respectively are mounted onto the side plate 12 adjacent the drive sprocket 23. The sprockets 40, 41 and 42 have suitable bearings in their centers which ride on the shaft 22 and elongated bolts 43 are passed through the side plate 12 and through each of the sprockets to hold the sprockets from rotating. The sprockets are thus held immobile and the shaft 22 will rotate inside the sprockets on the provided bearings. These sprockets are relatively large, as can perhaps be seen in FIG. 1. The sprocket 40 has a chain 44 mounted thereon which extends upwardly and is mounted over a sprocket 45 which in turn is drivably mounted onto the shaft 31 which is rotatably mounted at the outer ends of one pair of the legs 30 of the spiders 27. The sprocket 41 has a chain 46 mounted thereon which extends upwardly and is mounted over a sprocket 47 which, in turn, is drivably mounted onto the outer end of tubular shaft 32. Sprocket 42 has a chain 50 mounted thereon and which extends outwardly and is mounted over a sprocket 51 which in turn is drivably mounted onto the first end of tubular shaft 33.

Thus, it can be seen that with the chain connections

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between the sprockets 40, 41 and 42, respectively and the sprockets on the tubular shafts at the outer ends of the spiders, whenever the main shaft 22 is rotated the spiders will rotate and this in turn will cause the tubular shafts to rotate with respect to the spiders at the same time that they are rotating around the main shaft 22. Thus the tubular shafts are similar to planets which rotate about their own axis as they revolve around the axis of the main shaft.

The stationary sprockets 40, 41 and 42 and their chain drives will cause the rotation of the tubular shafts. The sprockets on the tubular shafts mesh with their chains, which stand still. The tubular shafts are rotated about their axes at the same time they revolve.

The stationary sprockets 40, 41 and 42 are three times as big as the sprockets 45, 47 and 51. Thus for each revolution of the main shaft 22 the tubular shafts at the outer ends of the spiders will have rotated three revolutions.

It should be noted that the ends of the tubular shafts 31, 32 and 33 adjacent the sprockets are plugged.

At the opposite ends of the tubular shafts 31, 32 and 33 from their attached sprockets, there are inserted suitable threaded connections 53 which seal in airtight relationship and open into the interior of the tubular shafts. Also, the rotary air carrying coupling 54 is in turn mounted on each of the threaded connections 53. The rotary air carrier couplings are commercially available and are designed so that they will transmit air pressure or vacuum from one side of the coupling to the other and will permit the threaded connections 53 to rotate while the connections 55 at the opposite ends of the coupling 54 remain stationary. These connections are well-known in the art.

The connections 55 at the outer ends of the rotary couplings 54 are connected through separate suitable conduits 56 to a first side 57 of a rotary vacuum carrying valve assembly 60. The rotary vacuum carrying valve assembly is perhaps best seen in FIGS. 5, 6 and 7. The first side portion 57 is drivably mounted onto the shaft 22 and rotates with the shaft. In this way the conduits 56 remain stationary as the shaft 22 rotates. Of course, because the shafts 31, 32 and 33 act as planets around the center of shaft 22 and rotate independently of the shaft 22 and with respect to the shaft, the rotary couplings 54 previously explained are necessary.

The vacuum valve assembly 60 also includes a stationary member or section 61 which is rotatably mounted with respect to the shaft 22 on suitable bushings and is held from rotating by using a suitable link connected to the member and to the adjacent side plate 12. The link 62 is shown in FIG. 2. The link is designed so that it will permit the stationary member 61 to move axially on the shaft but will not permit it to rotate.

The stationary portion 61 of the vacuum valve assembly is urged toward the portion 57 by a spring 63 which acts between a set collar 64 fastened to shaft 22 and a thrust washer 65 riding against an outer surface of the section 61. The stationary member is made of a suitable material having low friction properties, for example a nylon material, and will slide against the rotating member 57.

As shown, the rotating member 57, which rotates with shaft 22, has three axially extending cylindrical holes or vacuum carrying ports 66 provided therethrough. The ports 66 are spaced radially outwardly from the shaft axis and are spaced 120° apart on the same radius. Each of the conduits 56 is connected into a separate one of the ports 66, respectively.

The stationary valve member 61 is provided with an arcuate slot shaped vacuum carrying port 67 which opens to the surface 70 of the member 61, which in turn mates with the surface 71 of the member 57. The slot shaped port 67 has enclosed ends and is defined only partially through the member 61. The slot shaped port 67 is open through a suitable conduit 72 to a source of vacuum 73. Further, the member 61 is provided with an axially ex-

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tending hole 74 which merely passes through the member 61 and opens into the atmosphere.

The surfaces 70 and 71 mate together tightly enough under the urging of spring 63 so that the slot shaped port 67 will carry a vacuum.

Thus when any one of the cylindrical ports 66 in the rotating member 57 is aligned with the slot shaped vacuum port 67 (the opening and slot are on the same radius) vacuum is introduced into the corresponding conduit 56 and thus into the tubular shaft connected to that particular conduit. The vacuum is carried through the tubular shaft into the suction cup assembly 37 and to the suction cup 36. When the rotating member is rotated further, this opening or port 66 will become aligned with opening 74, and there will no longer be vacuum in this conduit and cup. For the rest of the revolution this opening 66 is under atmosphere pressure and is merely sealed off against the surface 70 of the stationary member. The cycle is identical for each of the openings 66 and the attached conduits.

The hopper 14 contains a plurality of coupons 76 which are urged by gravity toward the end adjacent the suction cup mechanism and which have suitable adjustable lugs 77 at the forward end thereof. The lugs 77 can be adjusted to hold the coupons 76 in place and prevent them from sliding out the end of the hopper 14. However, the coupons are flexible and can be pulled out past the lugs 77 in direction parallel to the floor of the hopper.

When the unit is to be used, the coupons 76 are placed in the hopper and the lugs 77 are adjusted as desired. The hopper and suction cup assemblies are adjusted so that when the spiders are in position as shown in FIGS. 1 and 3 the suction cup 36 associated with shaft 31 is positioned against the end coupon 76 and the hopper 14. Further, the axis of the tube 34 is substantially on the axis of the coupons and is parallel to the floor of the hopper 14. In this position the opening 66 for the tubular shaft 31 is open to the vacuum slot 67 in the stationary member 61 of the vacuum valve. The opening 66 is at the first end of the slot. Vacuum is thus introduced through the conduit 56, the center of shaft 31, the center of tube 34 to the suction cup 36 against the coupon. The end coupon 76 is sucked against the suction cup and the end coupon is held securely.

With the motor 26 running, the shaft 22 will be rotating in direction as indicated by arrow 80 in FIGS. 1 and 3. This immediately will start to move the shaft 31 away from the hopper 14. Also, because the shaft 31 is connected through sprockets 45 and chain 44 to the sprocket 40, which is stationary, the shaft 31 and its connected tube 34 and suction cup 36 will commence to rotate in direction as indicated by arrow 81 about the axis of shaft 31. As the shaft 22 is rotated further in direction as indicated by arrow 80 the shaft 31 will rotate in direction as indicated by arrow 81 independently of shaft 22 (the other shafts 32 and 33 will also be rotating). Three stages of the positioning of the suction cup 36 on shaft 31 as the shaft 31 rotates are shown in dotted lines in FIG. 3.

The shaft 31 will make one complete 360° revolution between the position with the suction cup against the end coupon in hopper 14 and its position wherein the suction cup extends downward as shown at 82. During the majority of the time that the shaft 31 is moving from its position against the hopper 14 to position as shown at 82 the opening 66 for shaft 31 is in communication with the slot 67 and therefore the interior of the shaft 31 and its suction cup are under a vacuum. However, just before the shaft 31 reaches its position wherein it will be positioned as shown at 82, the opening 66 will seal against a bridge portion 83 on the stationary member 61. The coupon will still be held because the suction cup 36 will be maintained under vacuum inasmuch as the two surfaces 71 and 70 will seal. However when the

coupon comes to position as shown in 82 it will be over an open package 85. The opening 66 which opens to the interior of the tube in position 82 will then connect to the atmosphere hole 74 in the valve member 61 and the vacuum on this cup will be dropped. This will permit the coupon 76 in this position to drop downwardly under the force of gravity and into the package 85 positioned below.

The process is continuous as long as the shaft 22 is rotating. Vacuum is introduced to each tubular shaft just prior to the time its associated suction cup engages the forward coupon in the hopper 14 and is released at the time it is positioned above the package 85 so that the coupon can be properly deposited into the package.

By having counter rotating planet shafts carrying the suction cup and an inclined hopper, it can be seen that the suction cups will be moving toward the end coupons in the hopper just before the cup contacts the coupon (see FIG. 8). The cups have an "overcenter" action and clear all the mechanism until the axis of the coupons in the hopper, the axis of the tube 34, the axis of the particular tubular shaft adjacent the coupons (as shown in FIG. 1 shaft 31) and the axis of shaft 22 all lie in a common plane. The suction cups have a compound motion which will make the suction cup engage the coupon in substantially axial direction with respect to the coupons in the hopper and, also, as the cup moves away from the hopper it will be moving in an axial direction. This makes the picking off of individual coupons a relatively simple job. See the position 86 of the cup just before it contacts the coupon in the hopper in FIG. 8.

Once the coupons have been placed in the package 85 the suction cup will be empty until it again reaches the hopper.

The over center action of the suction cups permits the cups to clear the brackets holding the coupons in place and then move toward the end coupon. Also the air flow into the suction cup will cause the coupon to move toward the cup. The cups can thus have a slight variation in clearance and still remove the coupon satisfactorily.

What is claimed is:

1. A rotary article placing machine comprising a main frame, an article hopper mounted on said main frame, bias means urging said articles in said hopper towards a first end thereof, a shaft rotatably mounted on said frame, a spider drivably mounted on said shaft, a plurality of tubular planet shafts rotatably mounted on said spider about separate axes spaced outwardly from the axis of rotation of said spider, said planet shafts all being spaced outwardly from the axis of said spider the same amount, a separate suction cup assembly mounted on each of said planet shafts, said suction cup assemblies comprising a tubular member open to the interior of said planet shafts and a suction cup positioned at the outer ends of said tubular members, means to rotate said planet shafts with respect to said spider whenever the spider is rotated about its axis, including a plurality of first sprockets mounted coaxial with said main shaft, and held stationary on said main frame, the number of said first sprockets corresponding to the number of planet shafts on said machine, a separate second sprocket driv-

ably mounted on each of said planet shafts, said second sprockets each being aligned with one of said first sprockets, and a separate chain drivably connecting each of the first sprockets to its aligning second sprocket, a separate conduit connected to the interior of each of said planet shafts, a rotary vacuum valve comprising a rotating member mounted on and rotating with said main shaft, said conduits each being open to separate provided ports in said rotary member, said valve further including a stationary member mounted coaxially with said rotating member and held from rotation with respect to said main frame, portions of said rotary member and said stationary member engaging each other in sliding sealing relationship, said stationary member having a slot partially defined therein and open to a source of vacuum, said stationary member further being provided with a separate opening open to atmosphere, means to rotate said main shaft, each of said suction cups being positioned to engage an end article in said hopper once during each revolution of said main shaft, said slot being positioned so as to sequentially communicate with said ports and connect the interior of each suction cup to the vacuum source when each cup contacts an end article and to maintain the vacuum on each suction cup for a predetermined number of degrees of rotation of said spider, each of said ports then in turn being in communication with said atmosphere opening in said stationary member.

2. The combination as specified in claim 1 wherein said spider has three planetary shafts thereon and said planetary shafts rotate three revolutions for each revolution of said spider.

3. The combination as specified in claim 2 wherein said planetary shafts rotate in opposite rotational direction from the main shaft.

4. The combination as specified in claim 2 wherein said hopper for said coupons is inclined upwardly in direction away from said spider and whenever a suction cup on said spider contacts an end coupon in said hopper the axis of said suction cup, the axis of the planet shaft to which it is attached, and the axis of said main shaft all lie in a common plane.

5. The combination as specified in claim 4 wherein each of said suction cups is subjected to vacuum for substantially 120° of rotation subsequent to receiving a coupon.

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