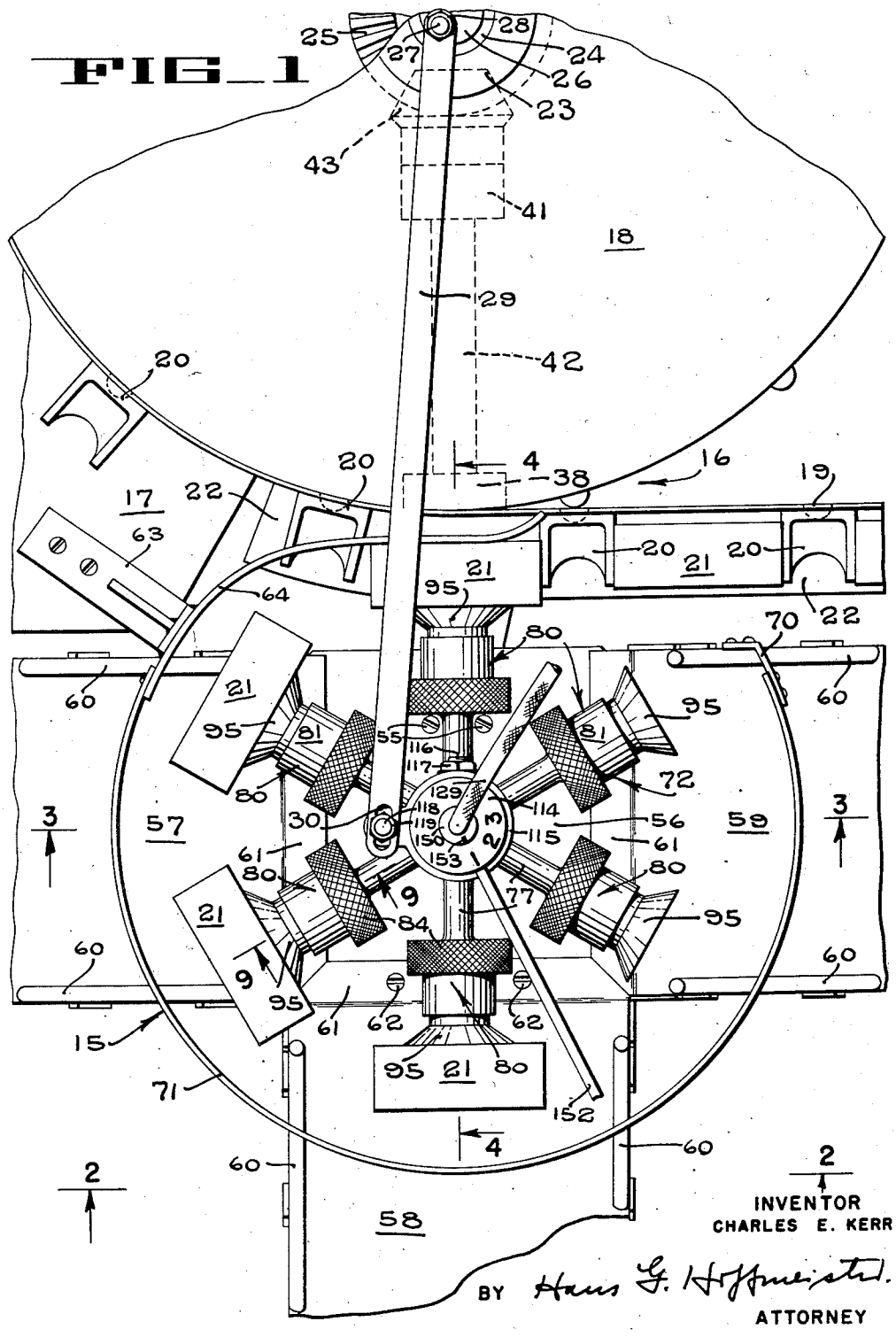
April 23, 1957 C. E. KERR 2,789,680

LINE DIVIDER

Filed Sept. 6, 1951 4 Sheets-Sheet 1

FIG. 1



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Filed Sept. 6, 1951 4 Sheets-Sheet 2

FIG_2

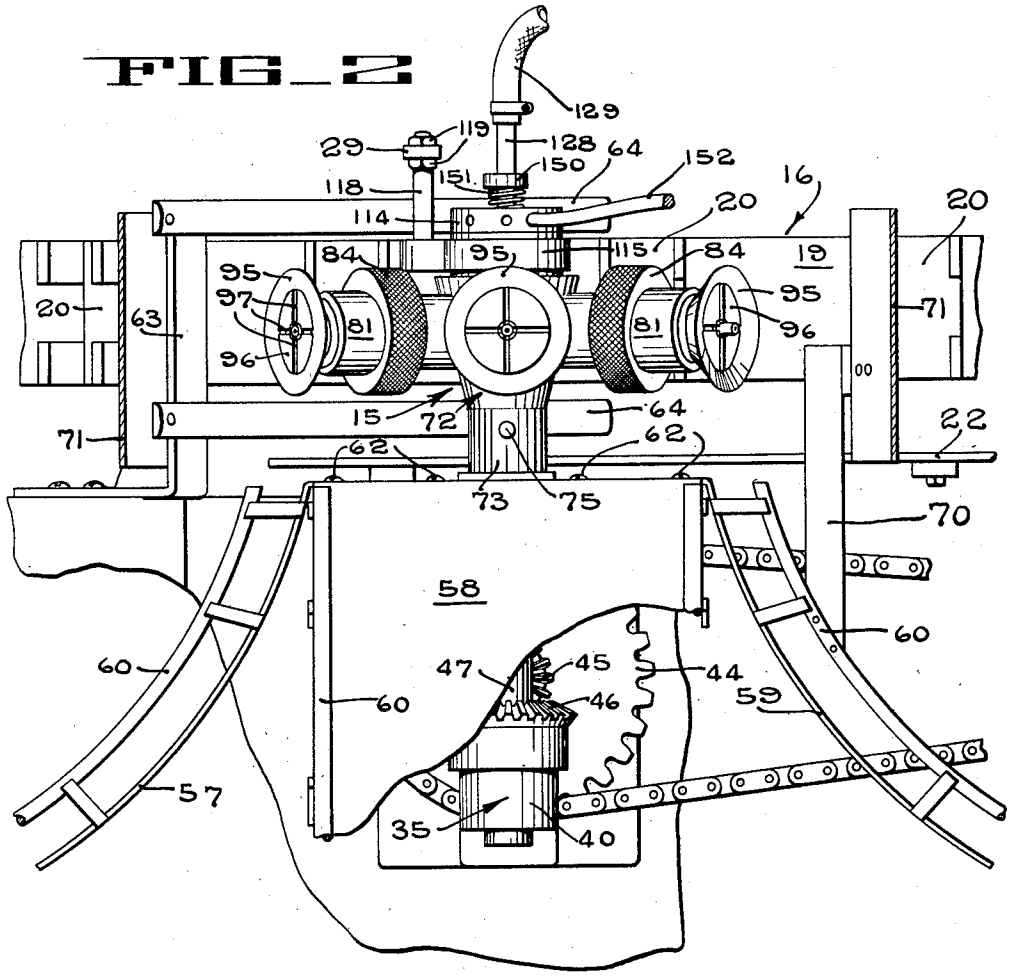
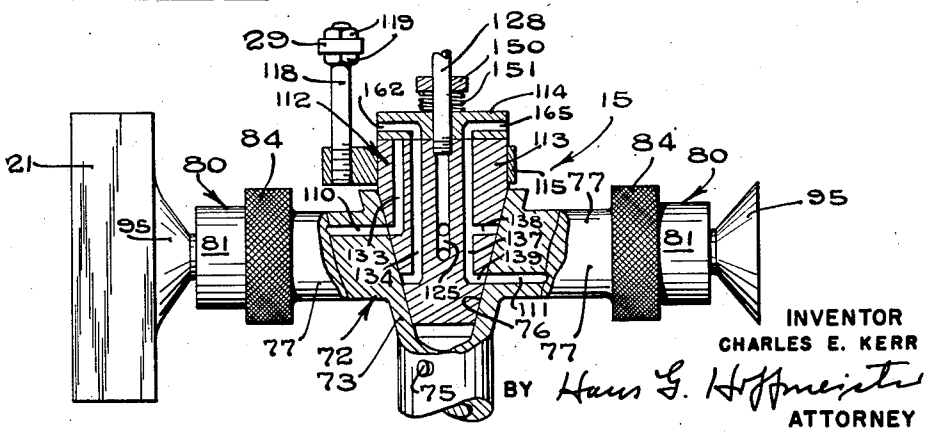


FIG_3



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LINE DIVIDER

Filed Sept. 6, 1951 4 Sheets-Sheet 3

FIG_4

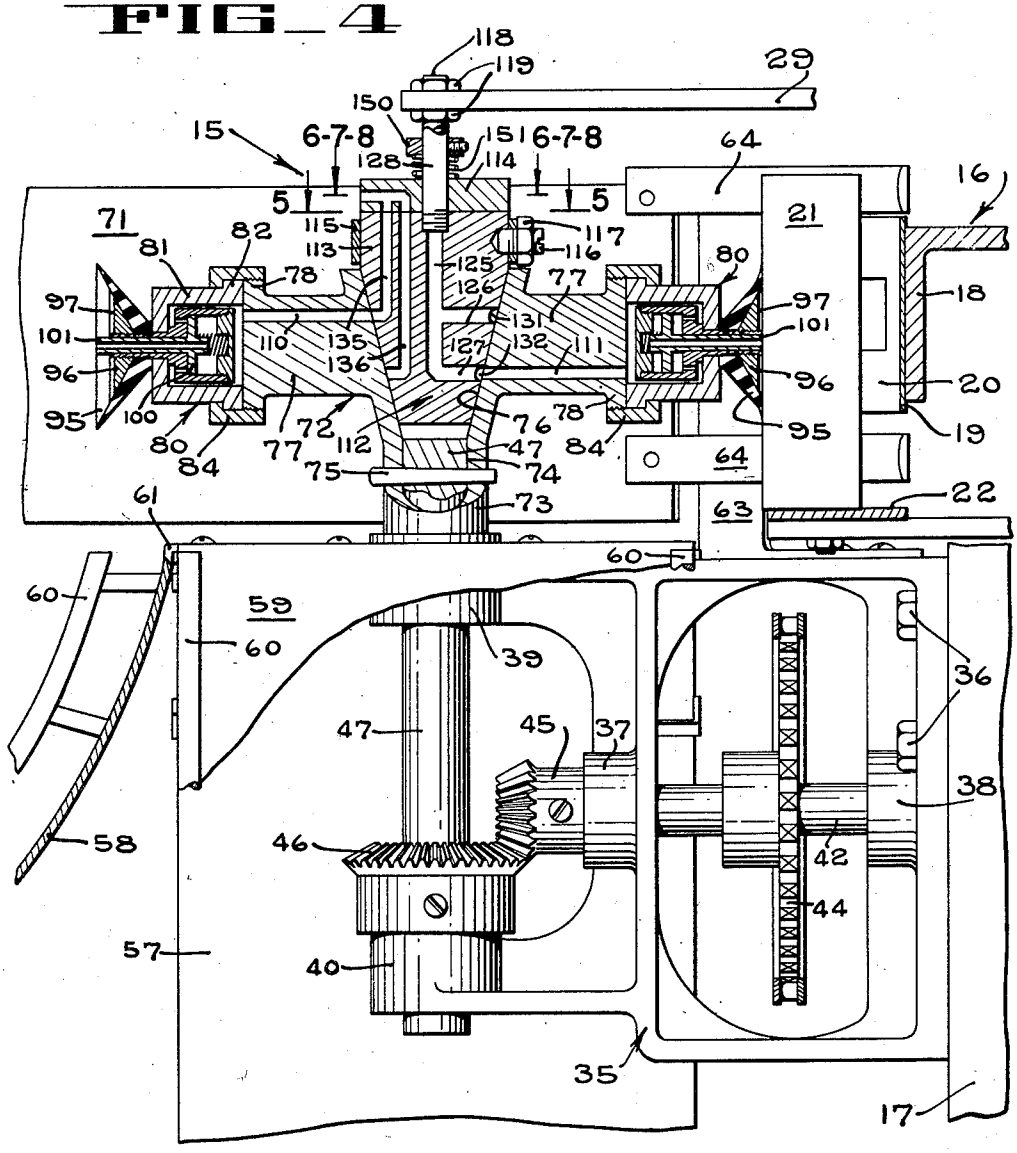
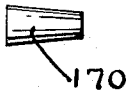


FIG_10



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April 23, 1957 C. E. KERR 2,789,680

LINE DIVIDER

Filed Sept. 6, 1951 4 Sheets-Sheet 4

FIG_5

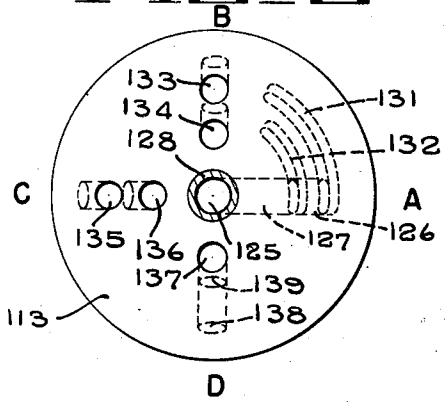


FIG_6

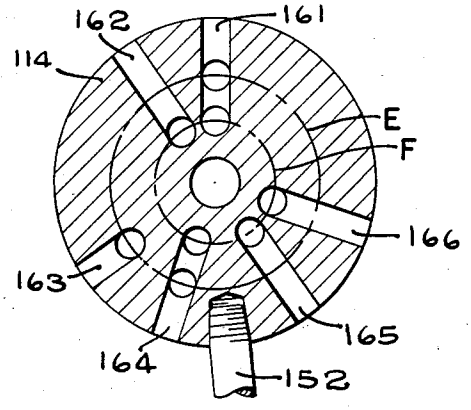


FIG_7

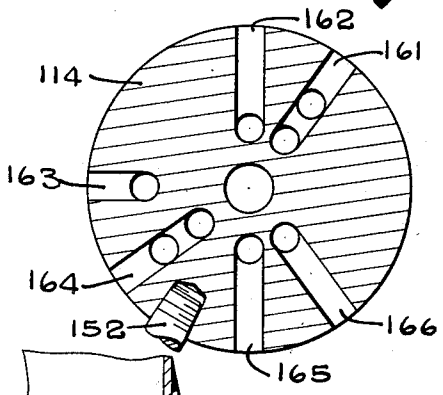


FIG_8

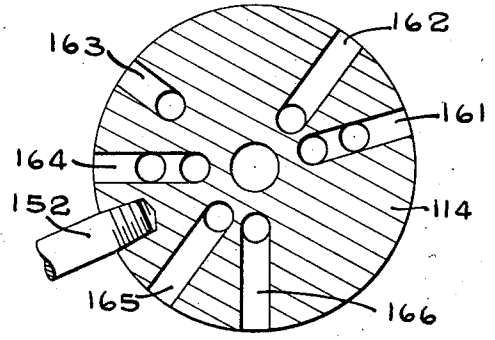
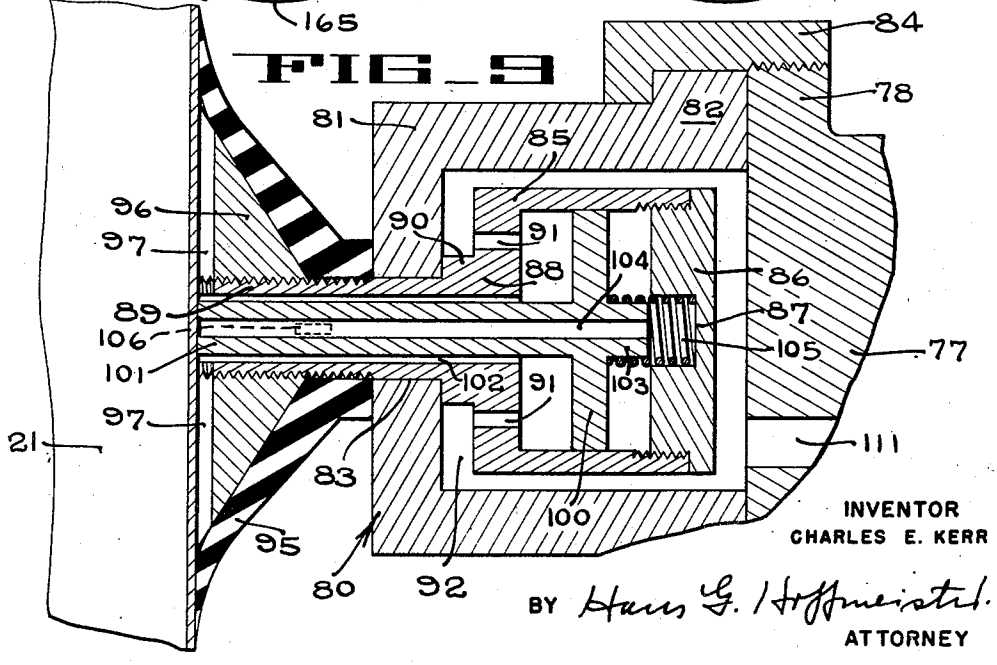


FIG_9



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United States Patent Office 2,789,680 Patented Apr. 23, 1957

2,789,680

LINE DIVIDER

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Application September 6, 1951, Serial No. 245,400

22 Claims. (Cl. 198—31)

This invention relates to a device for distributing, between a plurality of stations, a line of articles fed to said device. In the parlance of the art, it is termed a "line divider."

In machine packaging, successive operations are performed by different machines. Thus, in packaging food products in cartons for marketing the packaged product in frozen condition, the cartons, received in flat form, are opened, filled and closed in one machine called a "filler" and are subsequently wrapped in other machines, called "wrapping machines." As a single filler can fill cartons much more rapidly than a single wrapping machine, of the type in common use, can wrap cartons, it is necessary, if the filler is to run at full capacity, to divide the filled cartons delivered therefrom between at least two wrapping machines for the wrapping operation.

It is in dividing the filled and closed cartons discharged in a line from the filler and distributing these amongst the wrapping machines associated with said filler that the disclosed embodiment of the invention is particularly useful. Ordinarily two such wrapping machines are adequate to take care of one filler, and the normal need is to equally divide the output of the filler between the two wrapping machines. In case one of these must be shut down for any reason, it is necessary to start at once delivering the entire output of the filler temporarily to the other wrapping machine.

Where the output from one filler must be divided between one or more wrapping machines applying one type of wrapper and one or more wrapping machines applying a different type of wrapper, a more flexible control of the distribution is required. The present invention was developed to take care of all of the variations in control needed here.

It is, for instance, an object of the present invention to provide a line divider which may be used to divide a line of articles delivered thereto and distribute these between two or more stations in a prearranged proportion.

Another object is to provide such a line divider which is controllable to readily alter the portions of the articles received which are delivered to the respective receiving stations.

A further object of the invention is to provide such a line divider which is readily controllable to cause the same to divide said articles and distribute them amongst a plurality of stations in a prearranged proportion or, at the option of the operator, to deliver all of said articles to any one of said stations selected by the operator.

It is yet another object of the invention to provide a line divider capable of distributing the articles in said line amongst a group of stations, and which is controllable to permit the operator the option of selecting from a larger series of stations the particular stations to be embraced in the group receiving the articles.

The manner of accomplishing the foregoing objects as well as further objects and advantages will be made

manifest in the following description taken in connection with the accompanying drawings in which:

Fig. 1 is a plan view of a preferred embodiment of the invention shown as associated with a conveyor transporting a line of articles to the invention.

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1 with the guide wall shown in diametral section to disclose the suction wheel of the invention in side elevation.

Fig. 3 is an enlarged vertical sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is an enlarged vertical sectional view taken on the line 4—4 of Fig. 1.

Fig. 5 is an enlarged diagrammatic sectional view taken on the line 5—5 of Fig. 4 and shows the upper face of the tapered master valve plug of the invention in plan.

Fig. 6 is an enlarged horizontal sectional view taken on the line 6—6 of Fig. 4 and illustrating the internal construction of the rotary vacuum release control plate of the invention with said plate rotationally positioned relative to said master valve plug which lies immediately therebeneath, so as to cause the release of all of the articles gripped by said suction wheel, at the first of three predetermined stations at which the invention is controllable for selectively delivering said articles.

Fig. 7 is a view similar to Fig. 6, taken on the line 7—7 of Fig. 4 and showing said control plate rotated through a small angle in a clockwise direction from the position in which it is shown in Fig. 6 whereby said plate effects the release of half of the articles seized by said suction wheel at the first of said three stations and the other half of said articles at the second of said stations.

Fig. 8 is a view similar to Fig. 7, taken on the line 8—8 of Fig. 6, and shows said control plate after it has been rotated through a small angle in a clockwise position from the position in which it is shown in Fig. 7, whereby said plate is effective in causing the release of all of the articles seized by said suction wheel at the second of the three stations at which said articles are adapted to be released.

Fig. 9 is an enlarged fragmentary vertical sectional view taken on the line 9—9 of Fig. 1 and illustrating the structure of the vacuum cup and individual control valve assembly therefor, one of which is provided on the end of each of the arms of said suction wheel.

Fig. 10 is an elevational view of a plug which is adapted to be used with said control plate to selectively modify the action of said plate in determining at which stations articles are released from said suction wheel.

Referring specifically to the drawings the invention is there illustrated as embodied in a line divider **15** which is associated with an article conveyor **16** (Figs. 1, 2 and 4). The conveyor **16** is mounted on a frame **17** on which are pivotally mounted on spaced vertical axes a sprocket pulley **18** and another sprocket pulley (not shown) about which pulleys an endless perforated belt **19** is trained, this belt having an endless series of equally spaced pushers **20** fixed on the outer surface thereof. The intervals between adjacent pushers **20** are just sufficient to receive articles **21** which the conveyor **16** is designed to convey along a relatively straight line with said articles supported on a narrow platform **22** provided on said frame. While the articles **21** may be of any desired character the illustrated embodiment of the invention is designed particularly for handling packages of food such as cardboard cartons filled with a food product and sealed so that it presents the shape of a rectangular parallelepipedon. The pulley **18** has a hub **23** mounted on a hollow shaft **24** which carries an upturned bevel gear **25** on its lower end. The hollow shaft **24** is rotatably mounted on a heavy shaft **26** which is fixed on the frame

17 and which has extending upwardly therefrom a stud-bolt 27 carrying nuts 28. A perforated end of a bar 29 receives said bolt and is gripped between nuts 28. The opposite end of said bar has a slot 30, the purpose of which will be made clear hereinafter.

The line divider 15 includes a cast base bracket 35 which is secured as by bolts 36 to the frame 17 and has aligned horizontal bearings 37 and 38 and vertically aligned bearings 39 and 40. The frame 17 also has a bearing 41 which is aligned with bearings 37 and 38, a drive shaft 42 being journalled in these three bearings. Carried on the inner end of this shaft is a bevel gear 43 which lies above and meshes with gear 25 (Fig. 1). Fixed on shaft 42 between the bearings 37 and 38 is a drive sprocket 44 for driving the divider 15 and conveyor 16 in timed relation. Fixed on the outer end of shaft 42 is a bevel gear 45 which meshes with a bevel gear 46 on a vertical shaft 47 which journals in bearings 39 and 40.

Fixed on the upper end of the bracket 35 as by screws 55 is a rectangular floor 56, arcuate sheet metal chutes 57, 58 and 59 having side rails 60 and flanges 61 along their upper edges, being secured by screws 62 extending through said flanges to the respective ones of three sides of the rectangular floor 56.

Fixed on a bracket 63, mounted on frame 17, are a pair of spring guides 64 (Figs. 1, 2 and 4) which are spaced vertically apart to permit the article pushers 20 to pass therebetween, said guides engaging articles propelled thereagainst by said pushers so as to cam said articles away from the conveyor belt 19 and towards a suction wheel 72 (Fig. 1). Fixed to outer ends of the guides 64 and to a bracket 70 secured to the chute 59 is an arcuate guide wall 71.

The upper end of the shaft 47 extends above the bearing 39 and has fixed thereon a suction wheel 72. This wheel includes a hub 73 of inverted conical shape that has a bore 74, the lower end of which bore receives the upper end of shaft 47, said shaft being fixed to the hub 73 by a taper pin 75. The bore 74 is enlarged upwardly to provide a conical valve seat 76.

Radiating from the hub 73 are six equally spaced arms 77 having threaded flanges 78 at their outer ends. Mounted on the outer end of each of the arms 77 is a suction device 80. Each device 80 (Fig. 9) includes an assembly housing 81 which is in the form of a cylindrical cup having an annular external flange 82 at the brim thereof and a hole 83 formed centrally in the bottom of this cup. The housing 81 is secured in place on its respective arm 77 by a bonnet 84 which fits over the housing 81 against flange 82 and screws onto the threaded flange 78.

Contained within the housing 81 is a valve cylinder 85 which is also cup-shaped with the mouth internally threaded to receive a cap 86 having an internal central recess 87. The bottom 88 of the valve cylinder 85 has an externally threaded sleeve 89 extending axially therefrom through the hole 83 so that a shoulder 90 formed on said bottom 88 engages the bottom of the housing 81 so as to space the bottom of the cylinder from the bottom of the housing. Formed in the cylinder bottom 88 are holes 91 which communicate between the interior of the cylinder and a free space 92 within the housing which entirely surrounds the cylinder.

A rubber vacuum cup 95 fits over threaded sleeve 89 and a conical nut 96 is screwed onto this sleeve to compress this cup between said nut and the housing 81 to snugly assemble the cylinder 85 on the housing. The outer flat face of the nut 96 is provided with radial air grooves 97 which communicate with the outer end of sleeve 89 which is too short to reach the outer face of said nut.

Trapped within the cylinder 85 is a poppet valve 100 which is slidable therewithin and has a hollow stem 101 which extends therefrom through the sleeve 89 and leaves a free air space 102 between said stem and said sleeve which communicates between the area within said suction cup and the interior of cylinder 85. Projecting inwardly from the valve 100 is a nipple 103 there being a bore 104 which extends axially through the stem 101, the valve 100 and the nipple 103. Surrounding the nipple 103 and extending into the recess 87 is a light expansion coil spring 105 which returns valve 100 into contact with the cylinder bottom 88 whenever stem 101 is free from inward pressure against its outer end. If desired, a series of three lugs 106 may be provided to extend outwardly from the outer surface of the stem 101 to maintain this stem in co-axial alignment with the sleeve 89 while still permitting free flow of air through the space 102.

As may be noted in Figs. 3 and 4, alternate arms 77 of the suction wheel 72 have horizontal air passages 110 which are disposed at a relatively high level while the balance of said arms have horizontal air passages 111 disposed at a relatively low level. There are thus three arms which have passages 110, these arms being spaced uniformly 120 degrees apart, while the remaining three arms which are provided with passages 111 are also uniformly spaced 120 degrees apart. The outer end of each of the passages 110 and 111 communicates with the free space 92 of the suction device 80 which is associated with the arm 77 having said passage. The inner ends of the three passages 110 communicate with the conical valve seat 76 at a relatively high level while the inner ends of the three passages 111 communicate with said valve seat at a relatively low level.

The suction wheel 72 of the invention has a master valve 112 which includes the hub 73, a tapered master valve plug 113 which rotatably fits the conical valve seat 76 and a rotatable vacuum release control plate 114 which lies on top of the plug 113.

The master valve plug 113 has an upper cylindrical portion which fits snugly into a collar 115 which is united with said plug by a set screw 116 having a lock nut 117. The collar 115 is provided with a stud 118 extending upwardly therefrom, the upper end of this stud extending through the slot 30 formed in the bar 29, said bar being clamped between a pair of nuts 119 on said stud to determine the location of the stud 118 in the slot 30 and thus fix the plug 113 in a predetermined rotary position within the hub 73.

Formed centrally in the plug 113 is a suction passage 125 having a lateral passage 126 which is on the level of the passages 110 and a lateral 127 which is on the level of the passages 111, said laterals extending to the outer surface of the plug 113. The upper end of passage 125 is counter-bored and tapped to receive the lower end of a suction pipe 128 which may be connected as by a hose 129 to an evacuating pump.

There are four operating stations for the suction devices 80 as these travel about the master valve plug 113. These stations are identified in Fig. 5 by the letters A, B, C and D and it may be noted that these are 90 degrees apart. Station A is where suction is applied to said suction devices to cause the latter to capture an article 21. Stations B, C and D are opposite the respective chutes 57, 58 and 59 at which the invention is selectively operable to cause the release of said articles from said suction devices. It will be noted in Fig. 5 that laterals 126 and 127 lie in the vertical radial plane of and extend towards station A.

To give ample time for the establishing of suction in each of said devices when the latter is capturing an article, channels 131 and 132 are formed in the outer surface of plug 113 in the same horizontal planes respectively with laterals 126 and 127, and extending in a counter-clockwise direction from, and communicating with outer ends of said laterals (Fig. 5).

Formed in plug 113 in a vertical radial plane containing station B and opening outwardly from said plug

toward said station at their lower ends are vertical passages 133 and 134. It is to be noted that the lower end of passage 133 opens outwardly on the level of passages 110 and the lower end of passage 134 opens outwardly on the level of passages 111. In a like manner vertical passages 135 and 136 are formed in the plug 113 in a vertical radial plane passing through station C. Also formed in the plug 113 in a vertical radial plane passing through station D is a vertical passage 137 having laterals 138 and 139 opening outwardly therefrom towards said station on the levels respectively of said passages 110 and 111 (Fig. 3).

The rotatable vacuum release control plate 114 is in the form of a centrally apertured disc rotatably mounted on pipe 128 and resting on the plug 113 with the meeting faces of these elements ground to make a fluid tight rotary sliding fit therebetween. The pipe 128 is provided with a collar 150 which traps an expansion spring 151 between this collar and the plate 114 so as to continually press this plate snugly against the plug 113. Provided on the plate 114 is an arm 152 by which the plate 114 may be rotated in order to control the operation of the invention. As may be noted in Fig. 1, the collar 150 is provided with a radial mark 153 while the upper face of plate 114 has numerals "1," "2" and "3" stamped thereon said numerals being spaced apart at circumferential intervals of approximately 36 degrees. These numerals mark the three control positions of plate 114 each of which is attained by rotating the plate 114 until the number on said plate indicating said position is in radial alignment with the mark 153 on the collar 150. Fig. 1 shows plate 114 in control position 1. Rotating the plate 114 36 degrees in a clockwise direction brings it into control position 2. Rotating it 36 degrees further in a clockwise direction brings it onto control position 3.

The internal construction of plate 114 is illustrated in Figs. 3, 4, 6, 7 and 8. The only difference between Figs. 6, 7 and 8 is in the rotational position in which said plate is shown. Fig. 6 shows plate 114 in position 1; Figs. 3 and 7 show it in position 2; and Figs. 4 and 8 show it in position 3.

There are six radial suction release passages formed in plate 114, these being numbered 161, 162, 163, 164, 165 and 166. It is now to be noted that passages 133 and 135 in plug 113 are at a given radius from the axis of the plug while passages 134, 136 and 137 are uniformly at a smaller given radius from the axis of said plug. These two radii may be hereafter referred to respectively as radius E, the larger radius, and radius F, the smaller radius. Returning to the description of the plate 114 it is to be noted that each of the six suction release passages therein is provided with one or two laterals opening downwardly therefrom through the lower face of plate 114 on one or both of radii E and F. Thus passages 161 and 164 have such laterals located on both radii E and F. Passage 163 has a single lateral located on radius E, while passages 162, 165 and 166 each have one such lateral located on radius F.

It is believed unnecessary to describe the relative angular location about the axis of the disc 114 of the suction release passages 161—166 as this is clearly shown in Figs. 6, 7 and 8. A comparison of these views with Fig. 5 which shows the upper face of plug 113 on which the plate 114 rests in the assembled master valve 112 will also render quite clear the following description of the operation of this valve which results from the peculiar angular spacing of these suction release passages and the radial location of their respective laterals.

Operation

By the comparison of Fig. 5 with Fig. 6, it will be noted that with the plate 114 in position 1 the two laterals of suction release passage 161 communicate with passages 133 and 134 of valve plug 113. Thus, with the plate 114 in position 1, as illustrated in Fig. 6, the suction will be released in any of the suction devices 80 when the latter arrives at station B (Fig. 5), regardless of whether the arm 77 carrying that device has a high level passage 110 or a low level passage 111 as the suction release passage 161 in plate 114 now communicates through plug passages 133 and 134 with both of these levels.

Suction release passage 164 communicates with plug passage 137 with plate 114 in position 1 but this is of no consequence as with said plate in position 1 all articles carried by suction devices 80 are released therefrom at station B and fall downwardly onto chute 57.

With the plate 114 in position 2, as shown in Fig. 7, suction release passage 162 communicates with plug passage 134 at station B, suction release passage 163 communicates with plug passage 135 at station C and suction release passage 165 communicates with plug passage 137 at station D. Plug passages 133 and 136 are now closed. The result of plate 114 being in position 2, therefore, is that when any of the arms 77 of the suction wheel having a low level passage 111 arrives at station B, the suction device 80 mounted on said arm will be caused to release an article carried thereon so that this article will drop into the chute 57. With the plate 114 in position 2, however, as shown in Fig. 7, any suction wheel arm 77 having a high level passage 110 will pass right through station B without the article carried thereby being released because of the fact that plug passage 133 is closed by the plate 114 with the latter in position 2. As each such arm 77 having a high level passage 110 continues to rotate, however, until it arrives at station C, with the plate 114 in position 2, the vacuum will be released in the suction device 80 carried on this arm to this station so as to drop the article carried thereby onto the chute 58. As placing plate 114 in position 2 shown in Fig. 7 causes the articles carried by all arms 77 having low passages 111 to be released at station B, and the articles carried by all arms 77 having high level passages 110 to be released at station C, it is immaterial that, with the valve plate 114 in position 2, suction release passage 165 communicates with valve plug passage 137, as none of the devices 80 are under vacuum when they arrive at station D. However, as will be described later, passage 165 does have a function to perform with valve plate 114 in position 2 in a modified mode of operation of the invention.

With the valve plate 114 turned to position 3 as shown in Fig. 8, both passages 133 and 134 in plug 113 at station B are closed and both passages 135 and 136 thereof at station C are open to the atmosphere through suction release passage 164. With the plate 114 in this position plug passage 137 at station D is also open to the atmosphere through suction release passage 166. The result of plate 114 being in position 3 is thus seen to be that all articles carried by suction devices 80 are released at station C and fall into chute 58.

To summarize the operation of the line divider 15, it is to be noted in Fig. 1 that, as the suction wheel 72 rotates, the suction devices 80 carried on arms 77 are swung successively through station A. The suction device 80 at the right hand side of Fig. 4 is shown at this station. The vacuum cup 95 of this device at the moment of its arrival at station A, is contacted by an article 21 which has been pushed by a conveyor pusher 20 against the spring guide arms 64 so that this article is cammed towards and into engagement with said vacuum cup. The vacuum cup thus engaged is deformed by the article 21 thus pressed thereagainst as shown in Fig. 4, at the same moment that this cup is placed under suction by the communication of a passage 110 or 111 (whichever this arm 77 may have) with one of the laterals 126 or 127 of the axial vacuum passage 125 of the plug 113.

This pressure of an article 21 against said suction device 80 opens the valve 100 in that device by the pressure of the article on the hollow stem 101 of said valve as

shown in Fig. 9. This brings the suction space **92** within said device in communication through holes **91**, the interior of cylinder **85** and passage **102** with the radial grooves **97** within said device thereby causing a suction within the vacuum cup **95** thereof which grips the article **21** whereby this is captured by and supported on said device as the latter moves away from the guide arms **64**. The function of the valves **100** is to prevent the dissipation of vacuum through the line divider **15** when there is a temporary gap in the line of articles **21** being delivered thereto by the conveyor **16**.

The channels **131** and **132** (Fig. 5) retain each suction device **80** in communication with the axial vacuum passage **125** of plug **113** through a substantial angle as said device continues to swing in an anti-clockwise direction with the suction wheel **72** away from station A thereby perfecting the vacuum in said device and the grip which the same holds on the package **21** it has captured from the conveyor **16**.

As already described, placing the valve plate **114** in position 1 as shown in Fig. 6 results in all of the articles **21** carried by the suction device **80** being dropped when these devices arrive at station B (Fig. 5) so that these articles fall in chute **57** (Fig. 1). With the control plate **114** placed in position 2, which is to say, with the numeral "2" on said plate opposite the mark **153** (Fig. 1) in which position the internal structure of plate **114** is shown in Fig. 7, half of the devices **80** will be caused to release articles **21** carried thereby at station B and the other half of these will be caused to discharge articles **21** carried thereby at station C. With the plate **114** turned to position 3 thereby positioning the internal structure of said plate as shown in Fig. 8, all of the suction devices **80** of the suction wheel **72** will release the articles **21** carried thereby at station C causing said articles to drop into chute **58**.

The modified operation of the line divider **15** above referred to is effected by use of an ordinary cork or rubber plug **170** as shown in Fig. 10. As above described, the control exercised by the mere rotation of plate **114** to one or the other of its three positions is limited to dropping half of the articles carried by the suction wheel **72** onto chute **57** and the other half onto chute **58** or dropping all of said articles on chute **57** or all of them on chute **58**. By the use of a plug **170** in selectively closing certain of the suction release passages in the plate **114** (or the use of any other desired means of selectively closing these), a further control may be effected over the distribution of articles **21** by the suction wheel **72** between the chutes **57**, **58** and **59**. For instance, with plate **114** in position 2 and with a plug **170** inserted into the mouth of suction release passage **163**, half of the articles **21** carried by the suction wheel **72** will be released at station B and the other half will be released at station D, the latter articles dropping onto the chute **59**. On the other hand, with the plate **114** in position 2, as shown in Fig. 7, and with the passage **163** open and with passage **162** closed with a plug **170**, half of the articles **21** carried by the suction wheel **72** will be released at station C onto chute **58** and the other half will be released at station D onto chute **59**. With control plate **114** in position 3, as shown in Fig. 8, and with suction release passage **164** plugged by inserting plug **170** in the outer end thereof, all articles **21** carried by the suction wheel **72** will be released at station D and will drop onto chute **59**.

It is to be noted that chutes **57**, **58** and **59** may deliver the articles dropped thereon directly to machines for processing said articles such as machines for wrapping the same or packing said articles into shipping cases or said chutes may deliver said articles onto conveyors conveying the articles away.

It is also to be understood that the line divider **15** is of special utility in dividing a line of articles with a degree of flexibility above pointed out between two or more machines or conveyors leading to machines where the articles **21** have been produced by equipment having a substantially larger capacity than the aforesaid machines. This situation exists where the articles **21** are cardboard cartons filled with a food product the filler for which has a relatively high capacity and where these packages must be wrapped in wrapping machines each of which has a comparatively low capacity. The line divider **15** is adapted to adjust the division of the line of filled packages **21** coming from the filler between the chutes **57**, **58** and **59** which may lead respectively to separate wrapping machines.

It is to be understood, moreover, that the present invention has wide utility wherever a flexible distribution of packages delivered thereto by a conveyor line is required, that the embodiment selected for disclosure herein is illustrative only, and that many changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

The claims are:

1. In a line divider the combination of a conveyor adapted to carry a line of articles along a given path; a carrier mounted adjacent said conveyor; a plurality of pneumatic article capturing devices mounted on said carrier and adapted to be carried in a closed circuit to a plurality of stations by said carrier; means for driving said carrier in timed relation with said conveyor whereby said devices come successively into juxtaposed relation with articles in said line; pneumatic means for actuating said devices in timed relation with the movement of said carrier whereby each device captures an article in said line with which said device is juxtaposed and carries said article with it; and a releasing means common to all of said capturing devices for said mechanism causing a plurality of said devices to release certain of said articles at one predetermined position in the travel of said articles with said carrier, and the balance of said articles at another predetermined position in said travel, in order to divide the articles released at one position from those released at the other position.

2. In a line divider, the combination of a conveyor adapted to carry a line of articles along a given path; a rotor rotatably mounted in spaced relation with said path, a plurality of vacuum cups mounted on said rotor; means for rotating said rotor in timed relation with said conveyor whereby said vacuum cups come successively into juxtaposed relation with articles in said line; means for exhausting air from said vacuum cups in timed relation with said rotation, whereby each vacuum cup captures an article in said line with which said rotor is juxtaposed and carries said article away with it; and means operably connected to all of said vacuum cups for introducing air to certain of said cups to release said articles at one predetermined position in the rotation of said articles with said rotor and for introducing air to others of said vacuum cups to release articles at another predetermined position in said rotation in order to divide the articles released at one position from those released at the other position.

3. In a line divider the combination of a conveyor adapted to carry a line of articles along a given path; a rotor rotatably mounted in spaced relation with said path; a plurality of article capturing vacuum cups mounted on said rotor and extending radially therefrom; means for rotating said rotor in timed relation with said conveyor whereby said vacuum cups come successively into juxtaposed relation with articles in said line; pneumatic means for actuating said article capturing cups in timed relation with said rotation, whereby each cup captures an article in said line with which said cup is juxtaposed and carries said article away with it; and means disconnecting alternate vacuum cups on said rotor from said pneumatic means to release articles captured thereby at a predetermined position in the rotation of said cups with said rotor and disconnecting the balance of said cups

from the pneumatic means to release articles captured thereby at another predetermined position in the rotation of said cups with said rotor.

4. A combination as in claim 3 in which said disconnecting means is selectively operable to cause both of said groups of devices to release articles captured thereby at either of said two positions.

5. A combination as in claim 4 in which said disconnecting means is operable to selectively cause the release of articles carried by either of said groups of devices at any selected one of three positions in the rotation of said devices with said rotor.

6. In combination, means defining a loading station and a plurality of receiving stations, a movable carrier adapted to carry articles successively past said stations, a plurality of article capturing vacuum cups carried by said carrier, means for exhausting air from each of the vacuum cups in timed relation with the arrival thereof at the loading station to effect the capture of an article by the vacuum cup, and selective release means operably connected to all of said vacuum cups for disconnecting certain of said vacuum cups from said air exhausting means to release articles at a first discharge station and operable for disconnecting another of said vacuum cups from said air exhausting means to release articles at a second discharge station.

7. In combination, means for defining a loading station and a plurality of receiving stations, a carrier, article capturing vacuum cups mounted on said carrier and adapted to be carried by said carrier successively past said loading and receiving stations, means for exhausting air from each of said cups to capture an article at the loading station, release means operably connected to all of said cups for effecting the discharge of an article from each of said vacuum cups, and a control for said release means selectively operable to release articles at a plurality of the receiving stations or to release all articles at one receiving station.

8. In a line divider the combination of a conveyor adapted to carry a line of articles along a given path; a suction wheel rotatably mounted in spaced relation with said path; a plurality of suction devices radiating from the hub of said wheel, each of said devices presenting a vacuum cup at the extremity thereof; means for rotating said wheel in timed relation with said conveyor whereby said vacuum cups are brought successively into contact with articles in said line; suction means including a master valve mounted concentrically with said hub for evacuating air within said suction cups selectively as said cups contact said articles to cause said cups to capture said articles and remove the same from said line; and releasing means associated with said master valve and breaking said vacuum in said devices to release certain of said articles at one predetermined station in the rotation of said articles with said rotor, and releasing others of said articles at another predetermined station in said rotation, in order to divide the articles released at one station from those released at the other station.

9. A combination as in claim 8 in which said master valve includes the hub of said wheel, there being a rotary valve seat provided in said hub; a stationary plug fitting said seat; and a control plate slidably related with said plug, there being air passage means in said plug with which said devices are brought into communication when arriving in contact with articles as aforesaid to create a suction in said devices, there also being release passages in said plug communicating between said devices and said plate when said devices arrive at said stations, there being suction release passages in said plate which communicate between the atmosphere and certain of said plug release passages to cause the release of said articles as aforesaid at both of said stations with said plate in a given position, said plate also having release passages which, when said plate is shifted to a second position results in all of said articles being released at the first aforesaid station.

10. A combination as in claim 9 in which said plate has release passages which operate, when said plate is shifted to a third position relative to said plug, to communicate with certain of said plug release passages to cause the release of all of said articles at said other station.

11. A combination as in claim 8 in which alternate devices on said wheel communicate with said master valve through air passages located on a given level in said wheel and the balance of said devices communicate with said master valve through air passages located in said wheel at a substantially different level, the release of articles selectively from the devices of one of said groups at a given station being effected by a suction release passage provided in said valve and communicating at one end with the atmosphere and at the other end located at said station at the level of and in communication with the aforesaid air passages of said group of devices.

12. In a line divider for dividing a line of articles, the combination of: a suction wheel including a hub and spokes radiating therefrom, there being a concave valve seat concentrically formed in said hub opposite said spokes, and a radial air passage in each of said spokes; a series of suction devices one of which is mounted on the outer end of each of said spokes and connects with the radial air passage in said spoke, the other end of said air passage opening into said valve seat; valve plug means fitting said seat; and means causing said plug means to remain stationary while said wheel rotates; said plug means having suction passage means with which said air passages come into communication as said suction devices are brought, by said rotation, into contact with articles to be captured thereby placing said devices under suction and capturing said articles, said plug means also having suction release passage means which opens to the atmosphere and with which said air passages are subsequently brought successively into communication by said rotation thereby relaxing the suction in said devices and causing the articles captured thereby to be released at a plurality of locations.

13. A combination as in claim 12 in which said spoke air passages open into said valve seat at different levels and in which said suction release means opens outwardly from said plug means at said different levels at circumferentially spaced locations corresponding to the locations where release of said articles is desired, whereby a device connected with an air passage on a particular level is caused to release an article captured thereby when said passage comes into communication with said suction release means where the latter opens outwardly from said plug means at said particular level.

14. In a line divider the combination of a conveyor adapted to carry a line of articles along a given path; a carrier mounted adjacent said conveyor; a plurality of article capturing devices mounted on said carrier and adapted to be carried in a closed circuit to a plurality of stations by said carrier; means for driving said carrier in timed relation with said conveyor whereby said devices come successively into juxtaposed relation with articles in said line; a mechanism for actuating said devices in timed relation with the movement of said carrier whereby each device captures an article in said line with which said device is juxtaposed and carries said articles with it; a releasing means for said mechanism causing said devices to release certain of said articles at one predetermined station in the travel of said articles with said carrier, and the balance of said articles at another predetermined station in said travel, in order to divide the articles released at one station from those released at the other station, said capturing devices including a vacuum cup, from which said actuating mechanism evacuates the air to cause said cups to grip said articles and in which said releasing means functions to selectively break said

vacuum in said cups as the latter arrive at one or the other of said stations to release said articles at said stations in the manner and for the purpose indicated.

15. In a line divider, the combination of a rotatable carrier, a plurality of article capturing devices mounted on said carrier and extending radially therefrom, means for rotating said carrier to bring said devices into contact with articles to be captured, a mechanism for actuating each device while in contact with an article to effect the capture of said article, and releasing means causing alternate devices on said carrier to release articles captured thereby at a predetermined position in the rotation of said devices with said carrier and causing the balance of said devices to release articles captured thereby at another predetermined position in the rotation of said devices with said carrier, said releasing means being selectively operable to cause both of said groups of devices to release articles captured thereby at either of said two stations.

16. A combination as in claim 15 in which there are three potential stations at which said releasing means is adapted to cause said devices to release articles captured thereby and in which said release means is operable to selectively cause the release of the articles carried by either of said groups of devices at any selected one of said three stations.

17. In a line divider, the combination of a rotatable suction wheel, a plurality of suction devices radiating from the hub of said wheel, each of said devices presenting a vacuum cup at the extremity thereof, means for rotating said wheel to bring said vacuum cups successively into contact with articles to be captured, suction means including a master valve mounted concentrically with said hub for evacuating air within said suction cups selectively as said cups contact said articles to cause said cups to capture said articles, and releasing means associated with said master valve and breaking said vacuum in said devices to release certain of said articles at one predetermined station in the rotation of said articles with said carrier, and releasing others of said articles at another predetermined station in said rotation, in order to divide the articles released at one station from those released at the other station.

18. A combination as in claim 17 in which said master valve includes the hub of said wheel, there being a rotary valve seat provided in said hub; a stationary plug fitting said seat; and a control plate slidably related with said plug, there being air passage means in said plug with which said devices are brought into communication when arriving in contact with articles as aforesaid to create a suction in said devices, there also being release passages in said plug communicating between said devices and said plate when said devices arrive at said stations, there being suction release passages in said plate which communicate between the atmosphere and certain of said plug release passages to cause the release of said articles as aforesaid at both of said stations with said plate in a given position, said plate also having release passages which, when said plate is shifted to a second position results in all of said articles being released at the first aforesaid station.

19. A combination as in claim 18 in which said plate has release passages which operate, when said plate is shifted to a third position relative to said plug, to communicate with certain of said plug release passages to cause the release of all of said articles at said other station.

20. A combination as in claim 17 in which alternate devices on said wheel communicate with said master valve through air passages located on a given level in said wheel and the balance of said devices communicate with said master valve through air passages located in said wheel at a substantially different level, the release of articles selectively from the devices of one of said groups at a given station being effected by a suction release passage provided in said valve and communicating at one end with the atmosphere and at the other end located at said station at the level of and in communication with the aforesaid air passages of said group of devices.

21. In combination, a carrier, a plurality of article capturing vacuum cups mounted on said carrier and adapted to be carried by said carrier to a plurality of discharge stations, means for moving each cup into contact with an article at a loading station, means for evacuating said cup while in contact with said article to cause said cup to grip said article, and control means connected to each vacuum cup including means for selectively breaking the vacuum of each cup at a plurality of discharge stations.

22. In combination, a carrier, a plurality of article capturing vacuum cups mounted on said carrier and adapted to be carried by said carrier to a plurality of discharge stations, means for moving each cup into contact with an article at a loading station, means for evacuating said cup while in contact with said article to cause said cup to grip said article, and control means connected to each vacuum cup including means for selectively breaking the vacuum of said cups to release articles at a plurality of stations or to release all articles at the same station.

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