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J. M. CALEHUFF ET AL

2,915,201

SUCTION TRANSFER MECHANISM

Filed Feb. 12, 1958

4 Sheets-Sheet 1

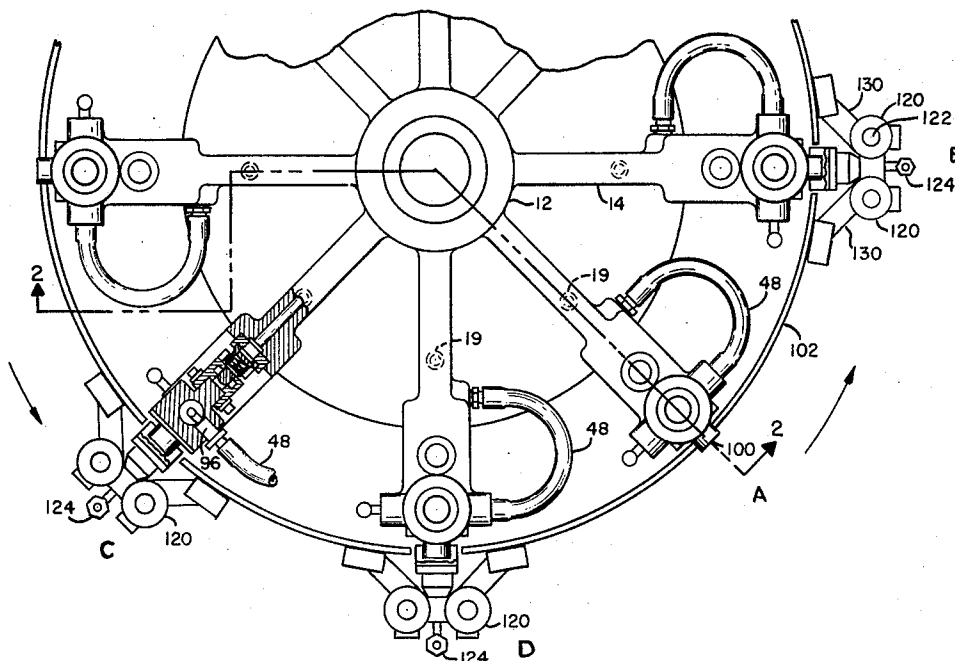


FIG. 1

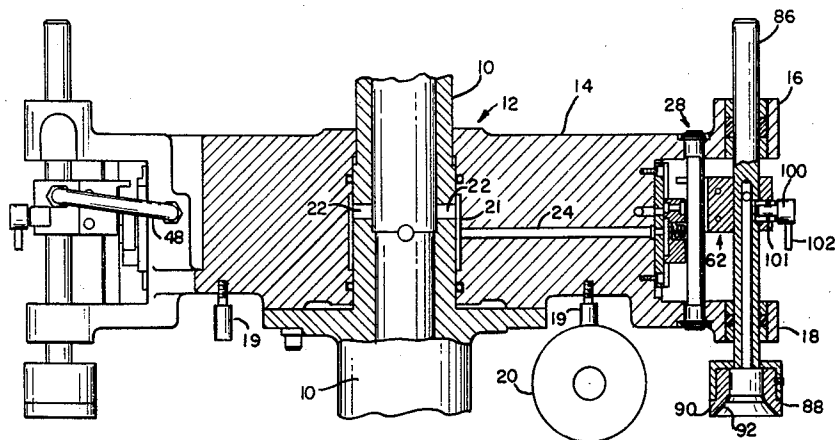


FIG. 2

INVENTORS

JAMES M. CALEHUFF
WILLIAM L. REITER
STANLEY L. SKOWRONSKI

BY *Michael Hertz*
ATTORNEY

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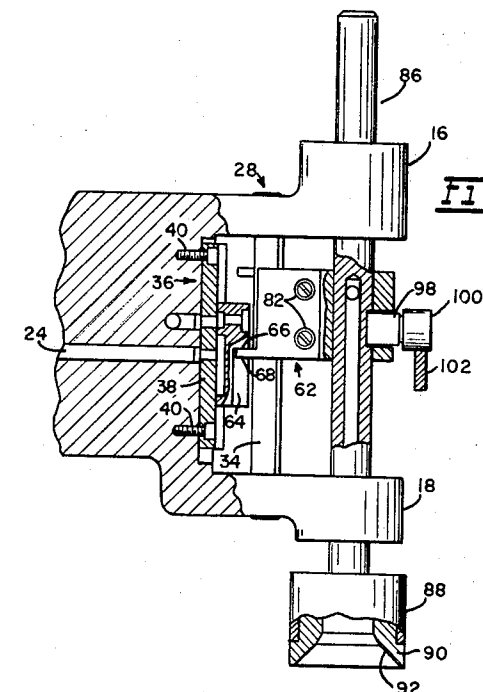


FIG. 4

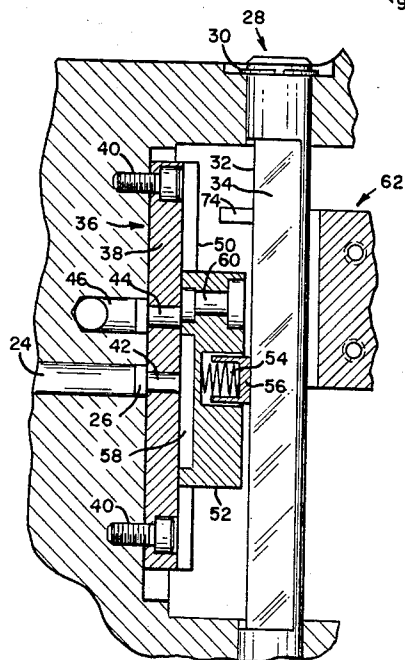


FIG. 3

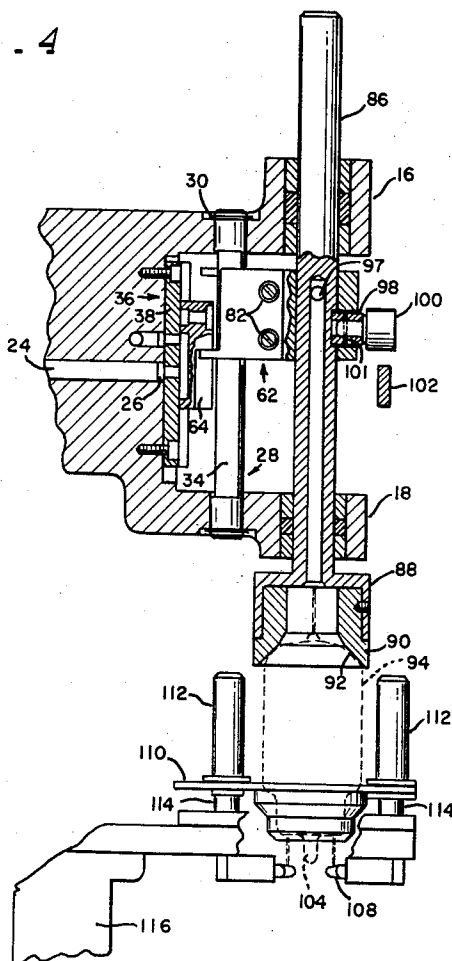


FIG. 5

INVENTORS

JAMES M. CALEHUFF
WILLIAM L. REITER
STANLEY L. SKOWRONSKI

BY *Michael Hertz*
ATTORNEY

Dec. 1, 1959

J. M. CALEHUFF ET AL
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4 Sheets-Sheet 3

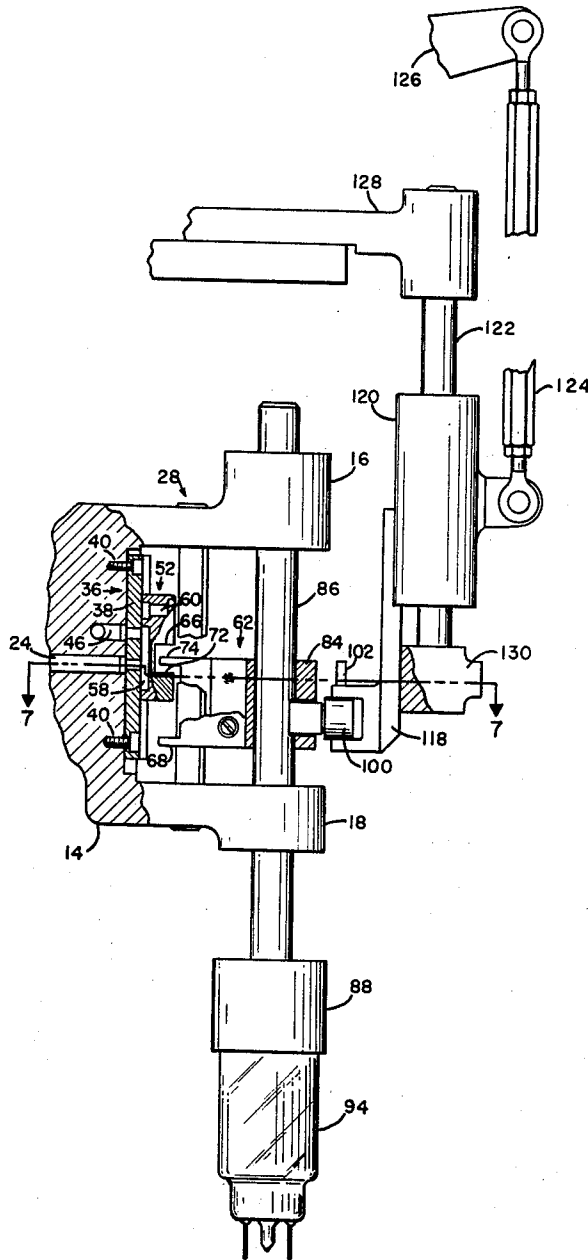


FIG. 6

INVENTORS

JAMES M. CALEHUFF
WILLIAM L. REITER
STANLEY L. SKOWRONSKI

BY *Michael Hertz*
ATTORNEY

Dec. 1, 1959

J. M. CALEHUFF ET AL
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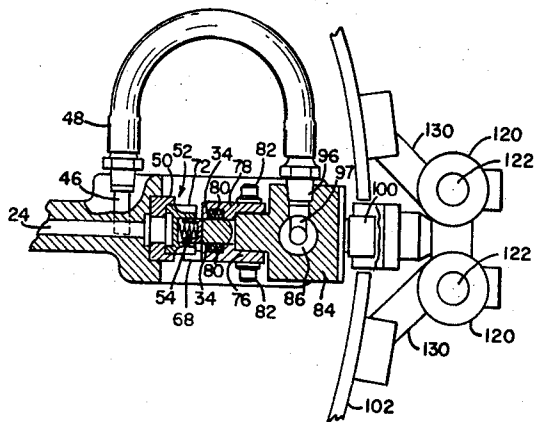


FIG. 7

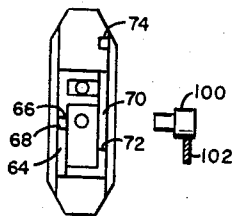


FIG. 9

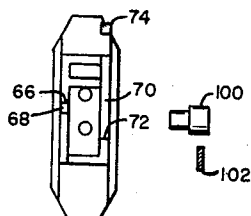


FIG. 10

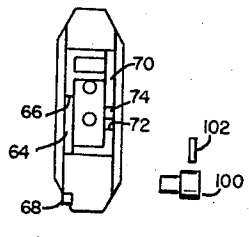


FIG. 11

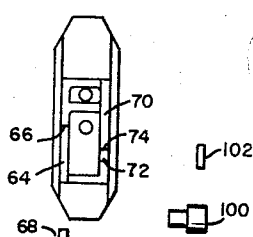


FIG. 12

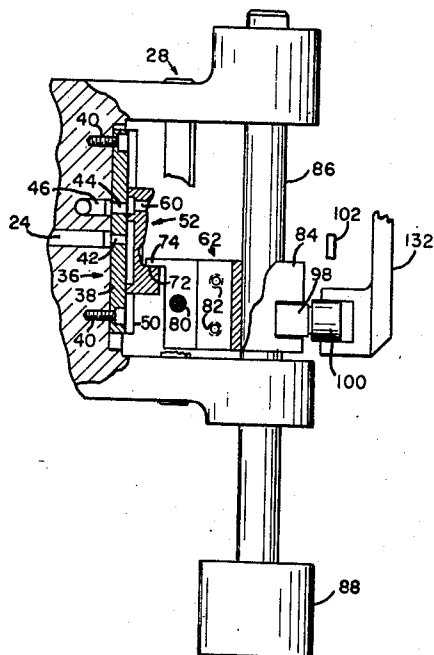


FIG. 8

INVENTORS

JAMES M. CALEHUFF
WILLIAM L. REITER
STANLEY L. SKOWRONSKI

BY *Michael Hertz*
ATTORNEY

1

2,915,201

SUCTION TRANSFER MECHANISM

James M. Calehuff, Montoursville, William L. Reiter, South Williamsport, and Stanley L. Skowronski, Williamsport, Pa., assignors, by mesne assignments, to Sylvania Electric Products Inc., Wilmington, Del., a corporation of Delaware

Application February 12, 1958, Serial No. 714,919

8 Claims. (Cl. 214—1)

This invention relates to a machine wherein articles are transported by a suction carrier, the suction being under control of movement of the carrier relative to the machine.

In the exemplification of the invention, a suction carrier is illustrated as mounted on an indexible turret arm movable in a horizontal orbit to index articles from one point to another. While so indexed, the carrier may be moved vertically relative to the arm a limited distance for article treatment without cutting off the suction to the carrier but upon greater vertical movement of the carrier, the suction is cut off and the carrier is vented to atmosphere, releasing the article.

It is an object of the invention to provide a simple valve control for a suction carrier whereby the functions pointed out above may be achieved. Other objects will become apparent upon more mature consideration of the following specification when taken in conjunction with the accompanying drawings in which:

Fig. 1 is a plan view of the turret of the machine with parts broken away and other parts shown in section.

Fig. 2 is a vertical section through the machine disclosed in Fig. 1 on the line 2—2 of Fig. 1.

Fig. 3 is an enlargement of a valve portion of the machine.

Fig. 4 is a vertical section through a suction nozzle and valve parts associated with the nozzle, showing the valve in a position wherein the suction to the nozzle is cut off.

Fig. 5 is a similar section showing how a vertically shifted radio tube has effected shifting of the valve to establish suction on the nozzle.

Fig. 6 is a view showing the nozzle in a lower position than is shown in Figs. 4 and 5 but with the suction nozzle still in communication with a source of suction.

Fig. 7 is a section on the line 7—7 of Fig. 6.

Fig. 8 is a view similar to Fig. 6, but showing the suction nozzle at its lowest position and with the suction to the nozzle cut off.

Figs. 9, 10, 11 and 12 are diagrammatic views of the positions of a slide valve relative to the body portion of the valve and of the positions of valve operating dogs, these positions corresponding to the positions of parts respectively in Figs. 4, 5, 6 and 8.

Now referring to the drawings in greater particularity, at 10 is illustrated a fixed vertical hollow shaft which may be mounted on a suitable base, not illustrated. On this shaft is rotatably mounted a turret 12 having arms 14, each arm having an upper bifurcation 16 and a lower bifurcation 18. Any suitable means, as for example a means similar to the barrel cam and rollers shown in Figs. 5 and 7 of Schneider et al. 2,312,003, is associated with the rotatable turret 12 to index the same. In diagrammatic form, there is herein disclosed rollers 19 and barrel cam 20 to effect indexing of the turret. The hub of the turret is recessed between its upper and lower faces as indicated at 21 to provide a suction chamber surround-

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ing the hollow shaft, and the shaft is provided with a number of ports 22 affording communication between the interior thereof and the suction chamber 21. Suction is applied at all times to the interior of the shaft. Each of the arms has a horizontal bore 24 communicating at one end with the chamber 21 and at the other end, see Fig. 3, terminating in a port 26 in the bight portion between the bifurcations 16 and 18.

Traversing the bifurcations 16 and 18 is a guide rod 28, the same being held against movement by snap rings 30 at the upper and lower ends of the rod. The rod while originally cylindrical in shape has three flat faces in between the ends, one face 32 lying parallel to the bight portion of an arm and two other faces 34 standing perpendicular to face 32. Mounted on the bight portion of the arm is a channeled valve block 36, fixed by its web portion 38 to the turret by two screws 40 and provided with two ports 42 and 44 registering respectively with the bore 24 and with a second bore 46 leading into and then laterally out from the arm for connection with a hose 48. Flanges 50 of the valve block serve to confine a reciprocating slide valve 52 against lateral movement and the slide valve is held against the web of the valve block by a spring 54 bearing against the bottom of a recess in the slide valve and provided with a cap 56 reacting against and adapted to slide along the face 32 of the guide rod.

The slide valve is provided with an elongated cavity 58, adapted in one position of the slide valve, to span the ports 42 and 44 in the valve block. It is also provided with a bore 60 through the valve from the first valve block engaging face to and through the opposite back face, which bore is adapted in another position of the slide valve to register with port 44 and in which position port 42 is shut off from communication with the port 44 by reason of the wall of the cavity 58 forming a septum between the ports 42 and 44. The back face of the slide valve is recessed as will be described to provide for a lost motion connection between a slide valve operator 62 and the slide valve 52. The slide valve has considerable thickness and its back is substantially rectangular in plan. Along one edge of the slide valve is a recess 64 extending up a little more than one half of the length of the slide forming a shoulder 66 to be engaged by a dog tooth 68 of the valve operator. On the opposite edge of the slide valve is a second recess 70 but extending down substantially three quarters of the length of the slide valve and forming a shoulder 72 to be engaged by a dog tooth 74 of the slide valve operator. The shoulders, it will be noted, face in opposite directions.

The valve operator is a split dog organization, the dog 76 being provided with a tooth 68 and the dog 78 being provided with a tooth 74. The dogs each slide on the rod 28 and are provided with lubricating pads 80 to reduce the sliding friction of the dogs on the rod. The dogs are clamped by means of screws 82 to a tongued block 84 fastened to a bored nozzle supporting shaft 86. The bore in the shaft, at its lower end, terminates in a suction cup 88 fitted with a fiber or other suitable cylinder 90 whose mouth is contoured or flared as at 92 to properly seat the article to be transported, such as radio bulb 94. The hose 48 which was previously described as communicating at one end with the lateral port or bore 46 is connected at its other end with a port 96 in the block 84, said port registering with an opening 97 leading into the bore of the shaft 86. The block 84 is retained on the shaft 86 by bushing 98 traversing the block and suitably held in a recess in the outer wall of the shaft 86 as by a tight fit.

Within the bushing is mounted the shaft of a cam track follower roller 100 which normally rides on a track 102.

concentric with the axis of rotation of the turret, the shaft being secured to the bushing by a tapered pin 101. In the normal elevation of the roller 100 (see Figs. 4 and 9) the dog tooth 68 is in engagement with the shoulder 66 and the slide valve has been shifted so that the suction nozzle via hollow shaft 86, hose 48, bore 46, port 40 and bore 60 in the slide valve is in communication with the atmosphere while suction is cut off from the nozzle by interruption of fluid flow through the valve chamber 58.

In the exemplification of this invention the radio tube is transported from a position wherein suction tubulation 104 extending down from the tube is sealed or tipped off, to stations at a lower level at which the lead-in pins are processed, as for example brushed. Intermediate these stations the tube is transported with the follower 100 riding on the track 102, but with the suction on the nozzle, as will be explained.

At the tipping off station there is usually provided a mechanism to raise the tube at the termination of the tipping off operation. It is sufficient for the purposes of this disclosure to point out that as the tube is tipped off by the burners 108, a carriage 110 rises, the same being lifted by fluid pressure in the upper ends of carriage mounted cylinders 112 movable up on hollow fluid supplied piston rods 114 fixed on an indestructible tube evacuating carrier 116. As the tube is elevated, the domed upper portion thereof engages and lifts the suction nozzle together with the shaft 86 and the attached slide valve operator. At this time the roller 100 will rise above the track 102.

The dog tooth 68, already in engagement with the shoulder 66, as shown in Figs. 4 and 9, now raises the slide valve to the position shown in Figs. 5 and 10, causing suction to be applied to the nozzle. Thereafter, the tipping off carriage may be lowered allowing the shaft 86 to drop until roller 100 again engages track 102. While dog tooth 68 recedes from the shoulder 66, dog tooth 74 does not come into engagement with its shoulder. Therefore, the position of the valve, held by the spring 54, does not shift and the suction remains on the nozzle.

After the tipping off carriage has been lowered to clear the base of the tube, the turret is indexed to the next tube processing station with the roller 100 riding on the track 102. For the purposes of this invention this processing station and some of the succeeding stations may be regarded as stations at which revolving and oscillating brushes engage the tube lead-ins to clean them. To reach the brush position it is necessary to lower the suction nozzle. This is effected by a movable track section in the form of a forked bar 118, see Fig. 6, normally at the track level and in a position to receive the roller 100 between the tines of the fork. The bar is secured to a pair of sleeves 120 slidable on guide rods 122 and lowered and raised in timed relationship with the indexing of the turret 12 by a link 124 connected to a lever 126 operated by a cam synchronized with the operation of the indexing of the turret. The rods 122 are supported from a fixed spider 128 atop the machine and at their lower ends carry a pair of spread out arms 130 to which the track sections 102 are fixed.

On the upstroke of the link 124, the roller 100 is again raised to the track level without slide valve shift and the turret arm 12 is indexed to a second and similar lead-in pin buffing station whereat the tube is again lowered and raised. After passing through several such stations and a tube rotating and orientating station, the turret reaches a tube unloading station above a tube Bakelite base which had been orientated so that its pins should be aligned with the lead-ins of the tube. At this station the track follower roller is engaged by a fork bar 132 similar to the bar 118. However the cam for this bar lowers the roller below the lead-in buffing position and sufficient to cause dog tooth 74 to engage shoulder 72

on the slide valve and to push the slide valve to the positions shown in Figs. 8 and 12 thereby to cause the suction to be cut off while venting the suction nozzle to atmosphere. If, for any reason, sufficient downward movement of the tube is not obtained to release the tube, as by reason of improper registration of the pins in the base with the lead-ins, the tube on lift of bar 132 will be carried to the next turret indexed position and a forked organization similar to the organization at the last station will cause the tube to be moved down, without restriction, to be released from the suction nozzle and deposited into a chute.

In Fig. 1, the exhaust tube tip-off and tube loading station is indicated as A and the next or pin cleaning station is indicated as B. It should be understood that the nozzle lowering and raising mechanism may be utilized at succeeding non-illustrated stations. The initial station whereat the nozzle is normally at an unloading elevation and whereat the tube and base are assembled is indicated as C and the next or chute discharge station is labeled D. There may be intermediate idler stations at which there would be no nozzle shifting mechanism and at which the roller 100 would roll across the station on the rail 102. The direction of rotation of the turret 12 is indicated by the arrow in Fig. 1. It should be noted that at any of the stations at which the nozzle is shifted by the link 124 the roller 100 is not lifted more than necessary to clear the track 102, so that the slide valve is not shifted upwardly when the operator is moving upwardly. Therefore, the only time the valve is shifted from a position where the nozzle is under atmospheric pressure to where it is under suction is when the tube being tipped off rises and lifts the suction nozzle and the operator 62.

Having thus described the invention, what is claimed is:

1. An article transfer mechanism comprising an arm, a suction nozzle having a support movably mounted with respect to said arm, a valve body fixedly mounted on said arm having a suction port and a second port connected with the interior of the nozzle, a reciprocatory slide valve having means, in one of its positions, to connect said ports together and having other means, in a second position of the slide valve, to interrupt the communication between said ports and to vent the nozzle, a slide valve operating member movable with said nozzle, and a lost motion connection between said operating member and the slide valve.

2. An article transfer mechanism comprising a suction nozzle, a support for said nozzle, means movably mounting the support for rectilinear movement, a slide valve operator fixedly mounted on said nozzle support, a slide valve, the slide valve operator having a mechanical lost motion connection with said slide valve, a fixed block cooperating with said slide valve having a first valve port adapted to communicate with a source of suction and a second valve port communicating with said suction nozzle, said slide valve having a cavity communicating with both valve ports in one position of the slide valve, and said slide valve being further provided with means to communicate with said second valve port, only, to vent the nozzle in another position of the slide valve.

3. An article transfer mechanism comprising an arm, a suction nozzle movably mounted with respect to said arm, a valve body fixedly mounted on said arm having a suction port and a second port connected with the interior of the nozzle, a reciprocatory slide valve having means, in one of its positions, to connect said ports together and having other means, in a second position of the slide valve, to interrupt the communication between said ports and to vent the nozzle, a slide valve operating member movable with said nozzle, and a lost motion connection between said operating member and the slide valve, said lost motion connection comprising a pair of shoulders on said slide valve spaced apart longitudinally

in the direction of motion of the slide valve and a pair of dog teeth on said operating member spaced apart in the direction of movement of the operating member a greater distance than the spacing between the shoulders.

4. An article transfer mechanism comprising a turret, a number of arms extending radially from said turret, a nozzle carrying member slidable in each of said arms, a nozzle at one end of each member, a ported fixed block mounted on the turret, one for each arm, each block having a first port adapted to be connected to a source of suction and a second port connected to the interior of the nozzle, a slide valve for each block mounted on the turret, movable to one position to cause said two ports to be placed in communication with one another and to a second position wherein the communication is disrupted and second port is in communication with a third port, said third port being associated with the slide valve and communicating with a source of higher pressure than the source of suction, means for operating said slide valve with a lost motion connection comprising a valve block operator fixed on its associated nozzle carrying member, a laterally extending follower on said operator, and a fixed track engageable by said follower extending about the turret.

5. An article transfer mechanism comprising a turret, a number of arms extending radially from said turret, a nozzle carrying member slidable in each of said arms, a nozzle at one end of each member, a ported fixed block mounted on the turret, one for each arm, each block having a first port adapted to be connected to a source of suction and a second port connected to the interior of the nozzle, a slide valve for each block mounted on the turret, movable to one position to cause said two ports to be placed in communication with one another and to a second position wherein the communication is disrupted and the second port is in communication with a third port, said third port being associated with the slide valve and communicating with a source of higher pressure than the source of suction, means for operating said slide valve with a lost motion connection comprising a valve block operator fixed on its associated nozzle carrying member, a laterally extending follower on said operator, a fixed track engageable by said follower extending about the turret, said track having spaced sections, and a reciprocable member engageable with said follower between said spaced track sections operable to move the slide operating member to a position displaced from the track engaging position but insufficient to take up the lost motion connection between the slide valve operator and the slide valve.

6. An article transfer mechanism comprising a turret, a number of arms extending radially from said turret, a nozzle carrying member slidable in each of said arms, a nozzle at one end of each member, a ported fixed block mounted on the turret, one for each arm, each block having a first port adapted to be connected to a source of suction and a second port connected to the interior of the nozzle, a slide valve for each block mounted on the turret, movable to one position to cause said two ports to be placed in communication with one another and to a second position wherein the communication is disrupted and the second port is in communication with a third port, said third port being associated with the slide valve and communicating with a source of higher pressure than the source of suction, means for operating said slide valve with a lost motion connection comprising a valve block operator fixed on its associated nozzle carrying member, a laterally extending follower on said operator, and a fixed track engageable by said follower extending about

the turret, said track having spaced sections, a follower engaging member movable across the track in the space between the sections, the movement of the member being of a magnitude to result in movement of the follower and attached slide valve operator through a distance sufficient to take up the lost motion connection between the operator and the slide valve and to move the slide valve to said second position.

7. An article transfer mechanism comprising a turret, a number of arms extending radially from said turret, a nozzle carrying member slidable in each of said arms, a nozzle at one end of each member, a ported fixed block mounted on the turret, one for each arm, each block having a first port adapted to be connected to a source of suction and a second port connected to the interior of the nozzle, a slide valve for each block mounted on the turret, movable to one position to cause said two ports to be placed in communication with one another and to a second position wherein the communication is disrupted and the second port is in communication with a third port, said third port being associated with the slide valve and communicating with a source of higher pressure than the source of suction, means for operating said slide valve with a lost motion connection comprising a valve block operator fixed on its associated nozzle carrying member, a laterally extending follower on said operator, and a fixed track engageable by said follower extending about the turret, said track also having spaced sections, and a reciprocable member engageable with said follower between said spaced track sections operable to move the slide operating member to a position displaced from the track supported position but insufficient to more than take up the lost motion connection between the slide valve operator and the slide valve, said track having further spaced sections and a second reciprocable member engageable with said follower between said second spaced sections, the movement of the second member being of a magnitude to result in movement of the follower and attached slide valve operator through a distance sufficient to take up the lost motion connection between the operator and the slide valve and to move the slide valve to said second position.

8. An article transfer mechanism comprising an arm having bifurcations, a shaft slidable transversely of the bifurcations, a suction nozzle at one end of the shaft, a valve block fixed to the arm between the bifurcations, said block having a suction port and a second port connected to the interior of the nozzle, a slide valve having a chamber adapted in one of its positions to effect communication between the two ports, a port vented to atmosphere in said slide valve adapted in a second position of the slide valve to register with said second port while closing off communication from said suction port with the second port, a guide rod transversely held in the bifurcations, a spring device carried by said slide valve and reacting between the rod and slide valve to maintain the latter against the valve block, a valve operating member mounted on said shaft for movement therewith and dogs having teeth mounted on said operating member engaging the rod to be guided thereby, the teeth having a lost motion connection with said slide valve.

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