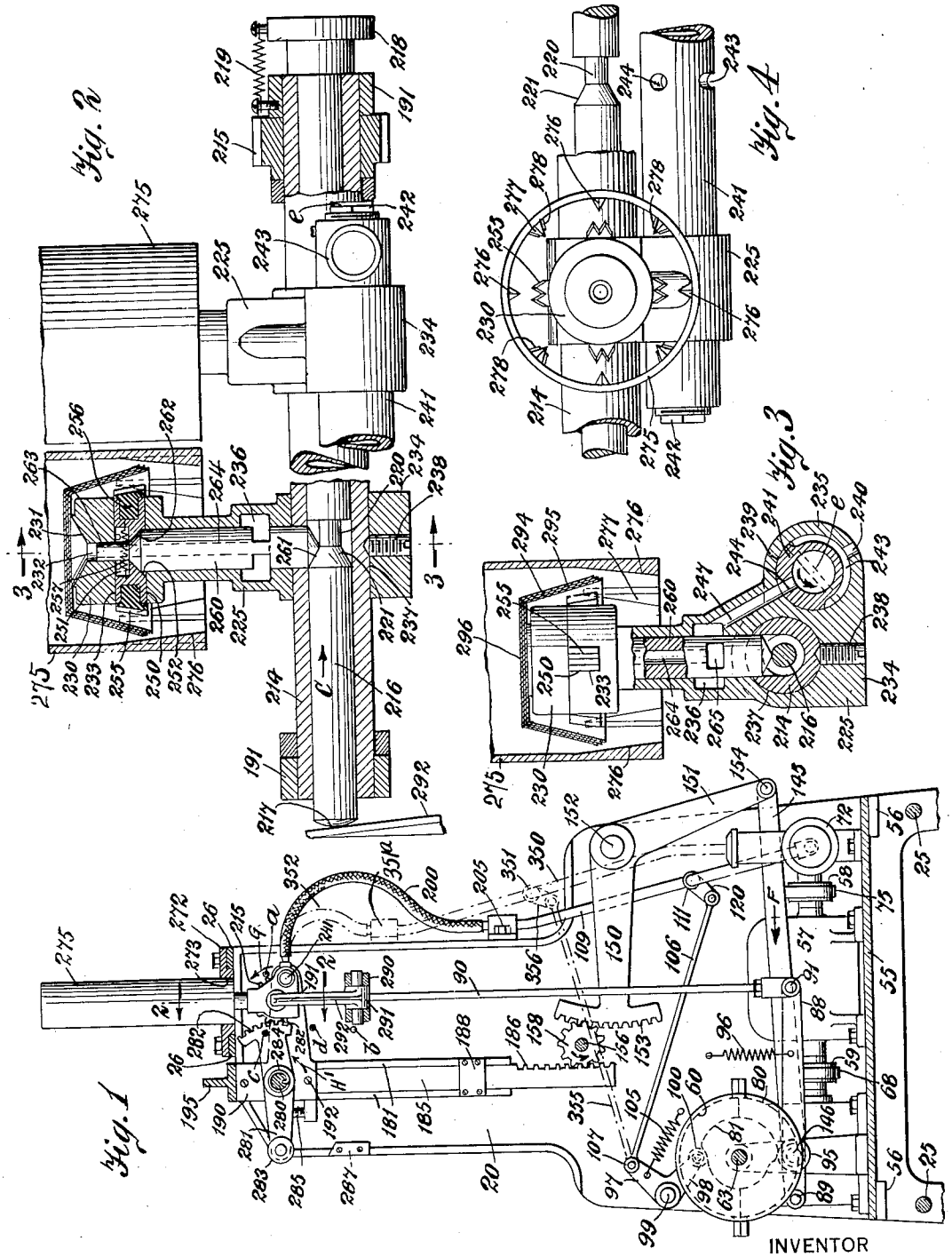
Feb. 6, 1934. C. F. ADAMS 1,945,846

CUP DROPPING MACHINE

Filed Nov. 5, 1932 2 Sheets-Sheet 1



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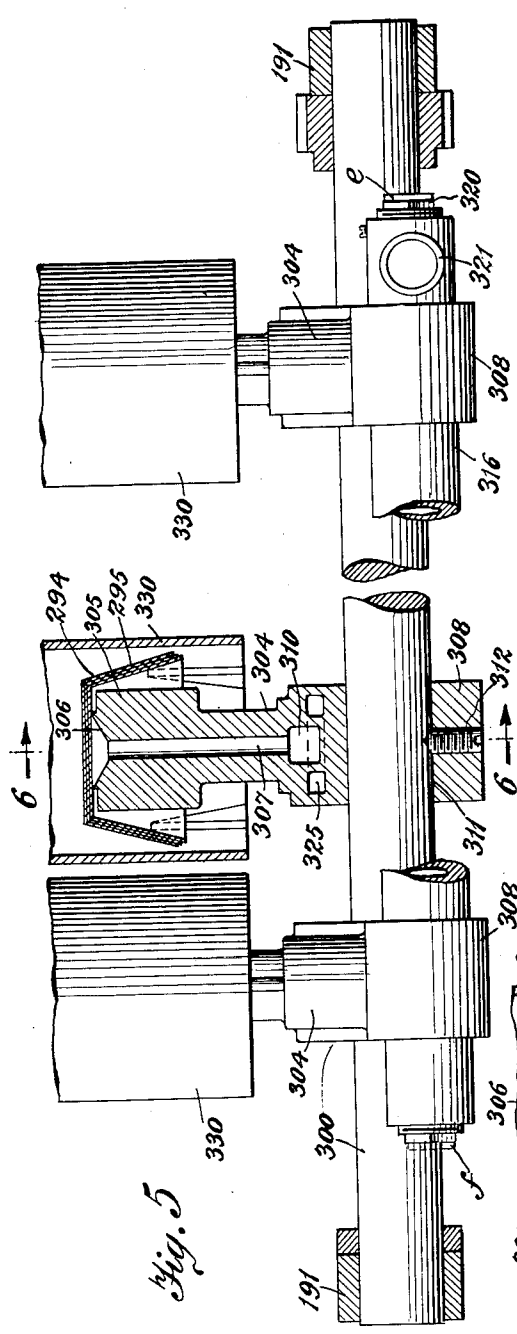


Fig. 5

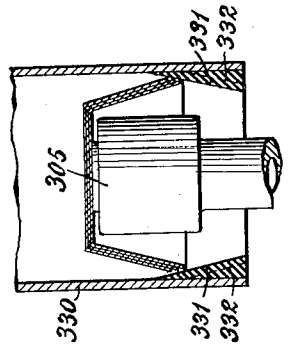


Fig. 8

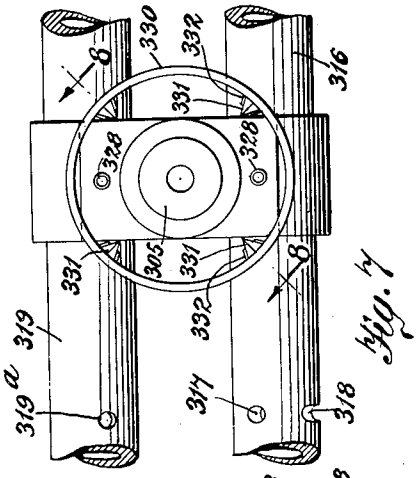


Fig. 7

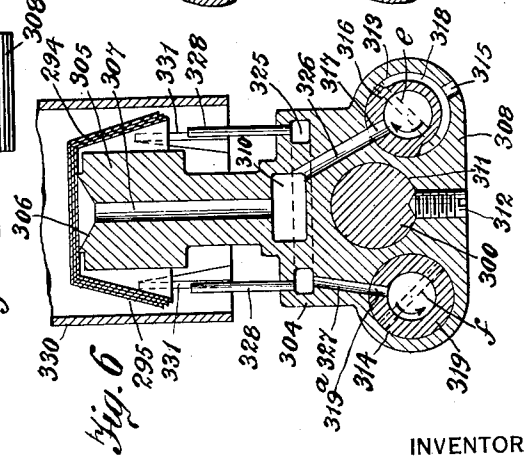


Fig. 6

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CUP DROPPING MACHINE

Charles F. Adams, New York, N. Y.

Application November 5, 1932. Serial No. 641,364

6 Claims. (Cl. 214—8.5)

This invention relates to a cup dropping machine, and is a modification and part continuation of my patent application for cup dropping machine, filed March 5th, 1932, Serial Number 596,561.

The object of the invention is the production of a machine wherewith a plurality of cups or other objects can be automatically separated from a plurality of them.

The second object of the invention is the production of a cup dropping machine, in which cups one after the other, are separated from a plurality of them, by means of a head, the appurtenances of which are brought into frictional engagement with the cups one at a time, while a partial vacuum is produced between the cup and said head.

The third object of the invention is the production of a cup dropping machine, in which cups or other objects are separated from a plurality of them by means of a partial vacuum and a blast.

In the accompanying drawings Fig. 1 represents a side elevation and partial vertical section of an exemplification of the improved cup dropping machine; Fig. 2 shows an enlarged partial side view and section of Fig. 1 on the line 2, 2; Fig. 3 is a section of Fig. 2 on the line 3, 3; Fig. 4 indicates a top view of a portion of Fig. 2; Fig. 5 shows a view similar to Fig. 2 with a modification; Fig. 6 represents a section on the line 6, 6 of Fig. 5; Fig. 7 is a partial top view of Fig. 5 and Fig. 8 is a partial section of Fig. 7 on the line 8, 8.

Referring particularly to Figs. 1 to 4 a frame is indicated having a pair of similar side members one of which is indicated at 20. Pins *a* and *b* extend from the member 20 shown in the drawings and pins *c* and *d* extend from the other member 20. The frames 20 are connected by the spacer bolts 25 adjacent to their lower ends, and by the cross connecting bars 26 at their upper ends. A platform 55 is supported upon and fastened to the lugs 56, which extend from the side members 20 of the frame. An electric motor 57 is supported upon and fastened to the platform 55. The armature shaft of the electric motor 57 has fastened thereto the pulleys 58 and 59. A housing is indicated at 60 and a shaft 63 extends through said housing. A belt 68 is indicated on the pulley 59 and appurtenances not shown are interposed between the belt 68 and the shaft 63 to turn the latter. A vacuum pump 72 is supported on the platform 55. A belt 75 is shown on the pulley 58, and appurtenances, not indicated, are interposed between the belt 75 and the vacuum pump 72 to actuate the latter. A disc 80 with a cam 81 are fastened to the shaft 63 adjacent to one end thereof and a similar second disc with a second cam not shown, are fastened to the shaft 63 adjacent to its other end.

A lever 88 has one end pivoted to one of the side members 20 by means of the pin 89. At the other end of the lever 88 is pinned the lower end of the connecting rod 90, by means of the pin 91. A roller 95 is pivoted to the lever 88 and is adapted to bear against the cam 81. A spring 96 has one end fastened to the lever 88 and its other end is fastened to one of the members 20 of the said frame. A bell crank having the arms 97 and 98 is pivoted to one of the members 20, by means of the pivot 99. A roller 100 is pivoted to the arm 98 and bears against the second cam, not shown, on shaft 63. A spring 105 has one end fastened to the arm 97 and its other end is fastened to one of the members 20 of the frame. A connecting rod 106 has one end pinned to the arm 97 by the pin 107. Piping 109 extends from the vacuum pump 72 and has connected thereto the valve 111. An arm 120 has one end connected to the spindle of the valve 111 and its other end is pinned to the connecting rod 106.

A link 145 has one end pivoted to the second disc (not shown) on the shaft 63 by means of the pivot 146. A gear segment is shown having the arms 150 and 151, and is pivoted to one of the members 20 by the pivot 152, and the arm 150 has integral therewith the segment teeth 153. The arm 151 is pivoted to the link 145 by the pivot 154. A shaft 156 has its ends journaled in the members 20 and has fastened thereto a pair of spur gears 158 one of which is shown.

A pair of guide strips 181 extend from each of the members 20 of the frame of the machine. A rack bar 185 having the rack teeth 186 is guided in each of the pairs of guide strips 181. A cover guide plate 188 is fastened to each pair of the guide strips 181. An L shaped bracket having the arms 190 and 191 is fastened to each rack bar 185, by means of the bolts 192.

A T bar 195 connects the arms 190.

A flexible tube 200 has one end connected to the piping 109, and the upper end of the latter is held in the bracket 205.

A tube 214 has its ends rotatably supported in the arms 191. A spur gear 215 is fastened to the tube 214. A controlling shaft 216 is slidably supported in the tube 214. One end of the shaft 216 is indicated with the rounded end 217, and at the other end of the shaft 216 is indicated the

stop collar 218. A spring 219 has one end fastened to the stop collar 218 and its other end is fastened to the adjacent arm 191. The shaft 216 has indicated thereon a plurality of controlling grooves having the cylindrical portions 220 and the tapered portions 221.

A plurality of suction heads are each indicated in its entirety by the numeral 225. Each of said suction heads comprises the head per se 230, which at its upper end has indicated therewith the tapered opening 231, leading to the axial port 232, and the said head 230 has formed therein four rectangular guide ways 233. A housing 234 with the extension 235, is indicated at the lower end of each of said heads 225. A chamber 236 is indicated at the upper portion of each housing 234. An opening 237 is indicated in each housing 234 for the tube 214. The said housing 234 is held in place by the screw 238 which is in threaded engagement with the said housing 234. In the extension 235 of the housing 234 is indicated a cylindrical seat 239, and the port 240 for the adjustable vacuum tube 241, closed at its ends by the screw plugs having the square heads 242. A cam lug *e* extends from one of the heads 242. A circumferential port 243 is indicated in the outer face of the tube 240, as well as the port 244, for each head 225. An inclined port 247 connects the chamber 236 and seat 239 of each suction head. Four horizontal guide blocks 250 are slidably supported in the guide ways 233 in pairs opposite each other. Each of the blocks 250 is shown with the recess 251 at its upper portion and the tapered concaved inner end 252 at its lower portion. Gripping fingers 255, preferably of rubber have each integral therewith the shank 256, each of which latter is securely seated in one of the guide blocks 250. Each pair of the guide blocks 250 is connected by a spring 257.

An operating plunger 260 is shown with the lower tapered end 261, and the upper tapered end 262 with the cylindrical nozzle 263. Cross ports 265 at the lower portion of the plunger 260 connect with the axial port 264. A supporting plate 272 having a plurality of openings 273 is fastened to the connecting bars 26. Cup supply cylinders 275 have each their lower ends positioned in one of the openings 273. In this instance the walls of the cylinders 275 are cylindrical, but may be corrugated or of other shape. On the inner face of the lower end of each cylinder 275 are indicated the tapered metallic fingers 276, and the fingers 277 of flexible material, like rubber. The latter fingers 277 are held in the clips 278 extending from the cylinders 275.

A cross shaft 280 has its ends fastened to the arms 190. A gear segment 281 is rotatably supported on the shaft 280, and at one end thereof has integral therewith the teeth 282 and at its other end is journaled the roller 283. A helical spring 284 has one end fastened to the shaft 280 and its other end is fastened to the segment 281. An adjusting screw 285 extends from one of the arms 191. A stop lug 287 is fastened to one of the members 20 of the frame of the machine. A lug 290 extends from one of the members 20, and has pivoted thereto the bell crank 291 having the elongated arm 292. The arm 292 bears against the end 217 of the shaft 216, and the other arm of the bell crank is pinned to the upper end of the connecting rod 90. The paper cups 294 to be dropped in this instance have each the tapered corrugated side wall 295 and the flat bottom wall 296.

Referring to Figs. 5 to 8, in place of the tube 214 there is substituted the shaft 300 which is rotatably supported in the arms 191 as described for the tube 214. A plurality of modified suction heads are each indicated in its entirety by the numeral 304.

Each of the latter suction heads comprises the head per se 305, which at its upper end has the tapered opening 306 leading to the axial port 307. A housing 308 is indicated at the lower end of each of said heads 304.

A central vacuum chamber 310 is indicated at the lower end of the port 307. A central opening 311 is shown in each housing 308 for the shaft 300. Each housing 308 is fastened to the shaft 300 by the screw 312. In the housing 308 are indicated the cylindrical seats 313 and 314. The seat 313 has the port 315. In the seat 313 is positioned the vacuum tube 316 having the port 317 and the annular port 318. In the seat 314 is positioned the blast tube 319 having the port 319*a*. The tubes 316 and 319 at their ends are provided with the screw plugs having the heads 320. A cam lug *e* extends from one of the heads 320 of the screw plug of the vacuum tube 316, and a cam lug *f* extends from one of the heads 320 of the screw plug of the blast tube 319, and is oppositely positioned to the cam lug *e*. An inlet opening 321 is indicated in the vacuum tube 316 and an oppositely positioned similar opening, not shown, is formed in the blast tube 319. An annular port 325 is indicated in each of the housings 308. A port 326 connects the seat 313 and the chamber 310, and a port 327 connects the seat 314 and the annular port 325. Blast nozzles 328 extend up from the annular port 325.

The cup supply cylinders are indicated at 330 and gripping fingers 331 similar to 277 are supported in clips 332, which extend from the inner faces of the lower portions of the cylinders 330.

Piping 350, Fig. 1, with the valve 351 extends from the exhaust outlet opening of the vacuum pump 72 and has its upper end fastened to the bracket 351*a* extending from one of the members 20, and a flexible tube 352 connects the piping 350 and a nipple positioned in the opening of the blast tube 319. A connecting rod 355 similar to 106 connects the pin 107 and the arm 356 extending from the valve 351. It is to be noted that the plungers 260 and the gripping fingers 255 with their appurtenances could be incorporated in the suction heads 304 indicated in Figs. 5 to 8.

To operate the machine the cup supply cylinders 275 are charged in this instance with the paper cups 294 in inverted position, one on top of the other.

The electric motor 57 is started, by means of which the vacuum pump 72 is operated and the shaft 63 is turned. The disc 80 and the similar disc on the shaft 63 turn. The coaction of second cam similar to 81 on the shaft 63, with the roller 100 moves the connecting rod 106 and thereby the valve 111 is opened and closed and a partial vacuum is produced in the piping 109 and in the tube 200, as well as in the vacuum tube 241, which is at this instant positioned as shown in Fig. 3. A partial vacuum is thereby produced in the suction heads 225. Just a little time before said partial vacuum is produced in the suction heads the coaction of the cam 81 with the roller 95 of the lever 88, the connecting rod 90 and the bell crank arm 292, the controlling shaft 216 is moved in the direction of the arrow C, Fig. 2. By this means the operating plungers 260 are raised and the pairs of flexible gripping fingers 255 are spread and are brought in frictional en-

gagement with the inner face of the lowermost cup 294, in each of the cup supply cylinders 275. At the same time portions of the walls 295 of a number of the cups 294 at the lower portion of the cylinders 275 are spread and brought into sliding contact with the metallic fingers 276 of the cylinders 275. When the partial vacuum is obtained in the suction heads 225, the lowermost cup 294 in each cylinder 275 is drawn by suction to the head 230. The link 145 now moves to the left in the direction of the arrow F (Fig. 1) which swings the segment having the arms 150 and 151, and thereby the spur gears 158 turn in the direction of the arrow indicated in Fig. 1. The rack bars 185 will thereby descend and the L shaped brackets having the arms 190 and 191 are lowered, as well as the gear segment 281, and the controlling shaft 216 with the suction heads 225 are lowered.

The roller 283 lowers until it strikes the stop lug 287 and then the gear segment 281 swings on the shaft 280, and the spur gear 215 will turn in the direction of the arrow G (Fig. 1).

By this means the suction heads 225 will revolve in the direction of the arrow G through an angle of 180 degrees.

When the suction heads 225 have been inverted the second cam similar to 81 on the shaft 63 coacts with the bell crank having the arms 97 and 98, which bell crank through the connecting rod 106 actuates the valve 111, by means of which the vacuum in the suction heads 225 is broken. At this instant the cam lug *e* of the vacuum tube 241 strikes the pin *b* and the said vacuum tube 241 is turned in the direction of the arrow shown in Fig. 3, to join the ports 244 and 240 whereby the vacuum on the suction heads 225 is broken. At the same time the shaft 216 is moved in a direction opposite to the arrow C, Fig. 2 and the springs 257 move the pairs of gripping fingers 255 toward each other and the cups 294 will be released from all the heads 230, and will drop into any suitable container not shown. After the said paper cups 294 have been released, the suction heads 225 are revolved to their original position. This is accomplished by the second disc on the shaft 63 coacting with the link 145, the gear segment having the arms 150 and 151, the spur gears 158 and the rack bars 185, which latter rise. As soon as the rack bars 185 rise, the spring 284 swings up the gear segment 281 in the direction of the arrow H^1, Fig. 1 until it strikes the adjusting screw 285, when the suction heads 225 are returned to their original position. The said rack bars 185 continue to rise and the heads 230 with their gripping fingers 255 again enter the cup supply cylinders 275.

When the suction heads 225 enter the cup supply cylinders 275, the cam lug *e* strikes the pin *a* and the vacuum tube 241 is turned in a direction opposite the arrow shown in Fig. 3 and the port 244 is positioned as shown in said Fig. 3, so that a vacuum can be obtained in the suction heads 225.

After the partial vacuum in the suction heads 225 has been broken the cam 81 on the shaft 63 coacting with the lever 88, the connecting rod 90, the bell crank arm 292, and the controlling rod 216, will be moved in a direction opposite the arrow C, Fig. 2 and thereby the operating plungers 260 will be lowered.

Referring to Figs. 5 to 8 inclusive the suction heads 304 are revolved on the shaft 300 as already explained for the suction heads 225 on the tube 214, and are also vertically moved as described for said suction heads 225.

The vacuum tube 316 is actuated by the pins *a* and *b* as already described for the vacuum tube 241.

Just before the vacuum is produced in the suction heads 304, the cam lug *f* strikes the pin *c* and the blast tube 319 is turned in the direction of the arrow in Fig. 6 and thereby communication is made between the port 319*a* and the port 327 by virtue of which the blast is discharged from the nozzles 328.

A partial vacuum is produced in the axial ports 307 of the suction heads 304, by means of the vacuum tube 316 and its appurtenances as described for the tube 241, by means of which the lower most cups 294 are drawn to the heads 305. The exhaust of the vacuum pump 72 flows through the piping 350, the tube 352, the blast tube 319 and from the latter is discharged from the blast nozzles 328, which separates the walls 295 of the paper cups 294 on the heads 305, from the wall 295 of the lower most of said cups. The outermost cups on the heads 305 are then brought into frictional contact with the flexible gripping fingers 331 and held in the cylinders 275 to allow the lowermost cup to be withdrawn therefrom.

When the suction heads 304 begin to lower and before the cam lug *f* strikes the pin *d*, the port 319*a* is separated from the port 327 which shuts off the blast.

Various modifications may be made in the invention and the present exemplification is to be taken as illustrative and not limitative thereof.

Having thus described my invention I claim:

1. In a machine of the character described the combination of a suction head to hold objects one after the other, supported in the machine, an axial port in said head, means to revolve said head, a vacuum tube supported in said head, means to produce a partial vacuum in said vacuum tube, a second port in the head interposed between the vacuum tube and said axial port to transmit the vacuum in said vacuum tube to said axial port to detachably hold said objects one after the other on said head, means to turn said tube to connect it with said second port and means to turn the tube in the opposite direction to break said vacuum and release said objects one after the other from said head.

2. In a machine of the character described the combination of a supply cylinder for objects to be separated, a suction head supported in the machine to hold said objects, an axial port in said head, means to position said head into said cylinder and remove it therefrom, means to revolve said head to an inverted position and return it to its original position, an operating plunger in said head, means to reciprocate the plunger, flexible gripping fingers slidably supported in the suction head coacting with said operating plunger to spread said fingers to contact them with said objects one after the other, means to move said fingers toward each other and thereby release them from said objects, a vacuum tube supported in the suction head, means to produce a partial vacuum in the vacuum tube, a port in the head interposed between the vacuum tube and the axial port in said head and means to break said vacuum.

3. In a cup dropping machine the combination of a plurality of cup supply cylinders supported therein, a plurality of suction heads in the machine coacting with said cylinders, an axial port in each head, each suction head adapted to sup-

port said cups one after the other, a chamber in each suction head coacting with its axial port, a cylindrical seat in each head, an inclined port in each head connecting said seat and said chamber, a second port in each of said heads extending from the outside to said seat, a vacuum tube rotatably supported in said seats, ports in said vacuum tube adapted to coact with said inclined ports, circumferential ports in said vacuum tube adapted to coact with said inclined ports and said second port, means to revolve said heads to an inverted position and return them to their original position, means to produce a partial vacuum in said vacuum tube and means to turn the vacuum tube in opposite directions while said heads revolve to transmit said vacuum to said axial ports and to break said vacuum.

4. In a cup dropping machine the combination of a frame comprising a pair of members, a plurality of cup supply cylinders supported in the machine, a plurality of suction heads supported in the machine adapted to detachably support cups, a chamber in each suction head, an axial port in each head connecting with said chamber, a cylindrical seat in each head, an inclined port connecting said seat and said chamber, a second port in said head extending from the inside to the outside of said seat, a vacuum tube rotatably supported in said seats, ports in said vacuum tube adapted to coact with said inclined ports, circumferential ports in said tube adapted to coact with said inclined ports and said second ports, a cam lug extending from one end of the vacuum tube, means to revolve said heads to an inverted position and return them to their original position, means to produce a vacuum in said vacuum tube and pins extending from one of the members of the frame, said cam lug adapted to contact with said pins while said heads are revolved to turn the vacuum tube in opposite directions to connect the axial ports of the heads with the vacuum means and to break the vacuum.

5. In a machine of the character described the combination of a supply cylinder for objects to be separated from a plurality of them, a suction head to detachably hold the objects of said cylinder one after the other, an axial port in the head, means to revolve the suction head to invert the same, means to position the suction head in said cylinder and withdraw it therefrom, a vacuum pump supported in the machine, means to operate the pump, a vacuum tube and a blast tube in the suction head, connections between the vacuum side of said pump and said vacuum tube, connections between the discharge side of said pump and said blast tube, blast nozzles in said head in connection with said blast tube, means to turn said vacuum tube to connect and disconnect its interior with the axial port of said head and means to turn said blast tube to connect and disconnect its interior with said blast nozzles, the blast flowing from the blast tubes separating some of the walls of said objects from one another, and the vacuum in the axial port of the head detachably holding said objects on said head.

6. In a machine of the character described the combination of a frame comprising a pair of members, supply cylinders for cups and other objects to be separated from one another in said machine, suction heads supported in the machine, an axial port in each of said heads, said heads adapted to detachably support said cups and other objects one after the other, a pair of cylindrical seats in each of said heads, a central vacuum chamber in each of said heads in connection with its axial port, a vacuum tube in one of said seats, a port in each head connecting said vacuum chamber and the seat of said vacuum tube, a blast tube in the other and second cylindrical seat, an annular port in each head, a port in each head connecting its annular port and said second seat, blast nozzles extending from said annular ports, a vacuum pump in said machine, means to operate the pump, connections between the vacuum side of said pump and said vacuum tube, connections between the discharge side of said pump and said blast tube, means to revolve and invert said suction heads, a cam lug extending from one end of said vacuum tube, and a cam lug extending from one end of said blast tube and oppositely positioned to the cam lug of the vacuum tube, pins extending from one of the members of the frame adapted to contact with the cam lug on the vacuum tube to turn it in one direction to connect its interior with the axial port of its head and then turning the vacuum tube in an opposite direction to break said connection and the vacuum in the head and a pair of pins extending from the other member of the frame adapted to contact with the cam lug of the blast tube to connect and disconnect the discharge side of the pump with said blast nozzles.

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