Feb. 11, 1958 C. H. MAYER, JR 2,822,651

CANDY CUP SETTING AND LOADING MACHINE

Filed June 6, 1956 4 Sheets-Sheet 1

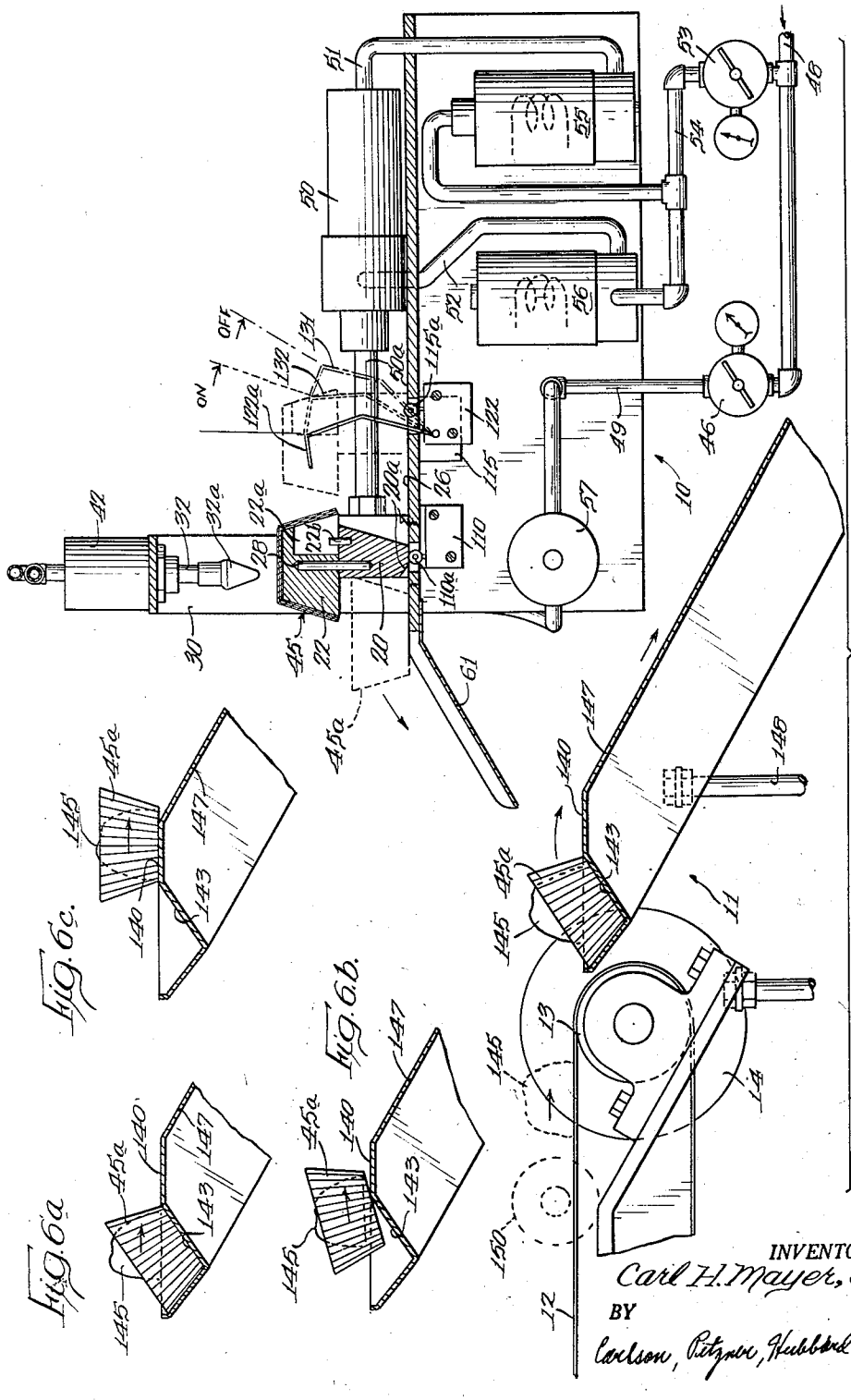


FIG. 1.

FIG. 6c.

FIG. 6b.

FIG. 6a.

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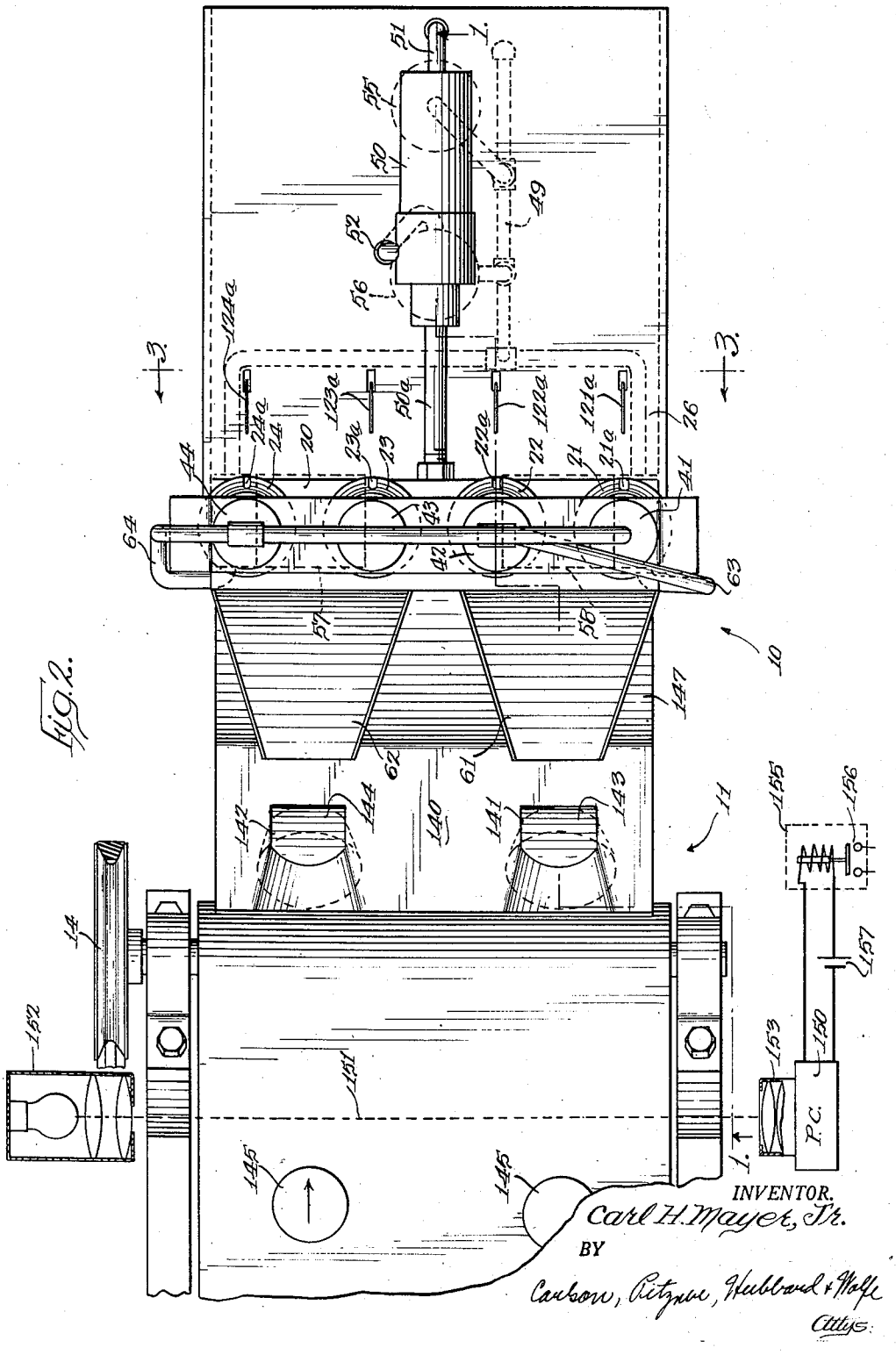


Fig. 2.

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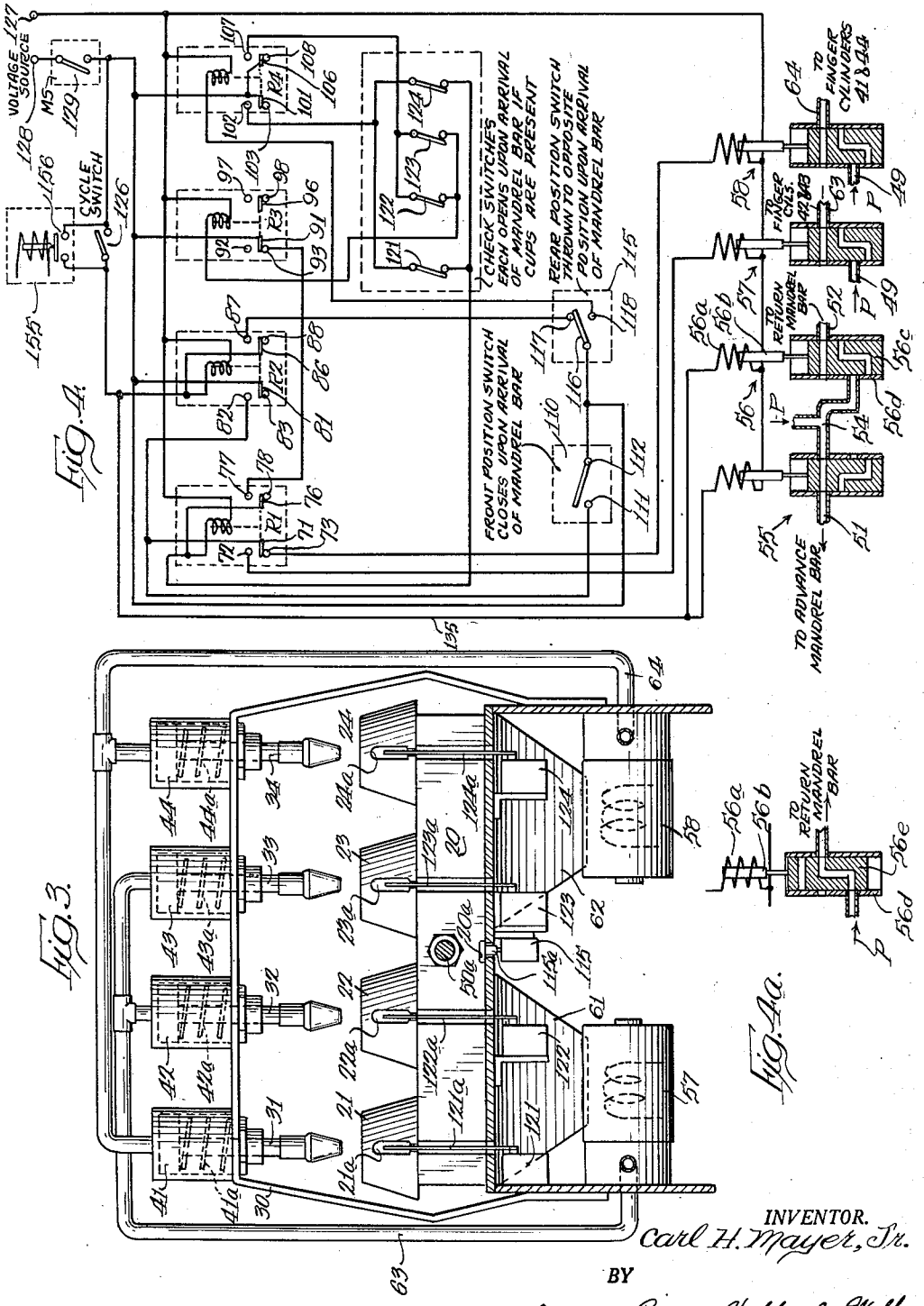


Fig. 4.

Fig. 4a.

Fig. 3.

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CANDY CUP SETTING AND LOADING MACHINE

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Fig. 5a.

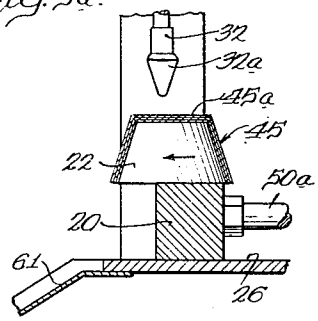


Fig. 5b.

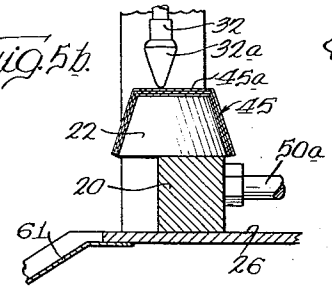


Fig. 5c.

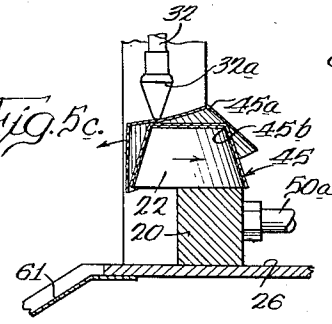


Fig. 5d.

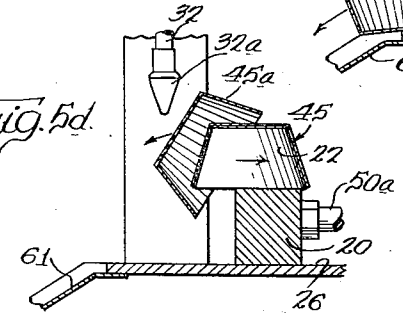


Fig. 5e.

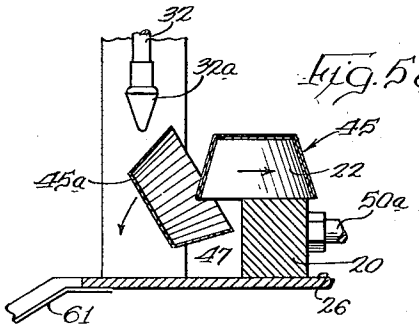


Fig. 5f.

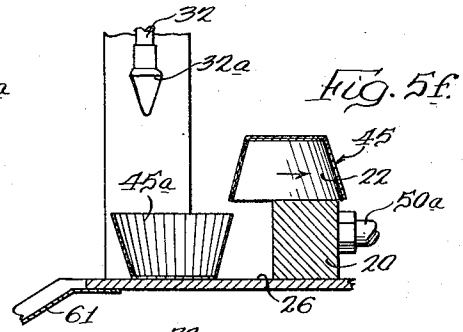
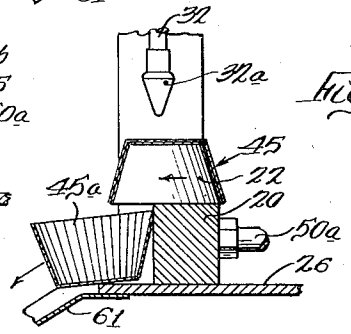


Fig. 5g.



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CANDY CUP SETTING AND LOADING MACHINE

Carl H. Mayer, Jr., Wilmette, Ill.

Application June 6, 1956, Serial No. 589,633

13 Claims. (Cl. 53—70)

The present invention relates to the packing of individual products or elements, and more particularly to the setting and loading of paper cups for mechanized packing of candy.

In the confectionery industry, the packing of candy or the like in individual paper "glassine" cups prior to boxing has required much hand labor. Conventionally, this work is done by a row of girls seated in front of a moving belt carrying pieces of candy. One hand is used to lift the piece of candy from the belt, the other to separate and remove a paper cup from a compact stack of such cups. The cups are of well-known frusto-conical shape, stamped and formed in groups of about fifty, with the wall thereof sharply pleated so that each cup, upon removal from the stack, tends to hold its shape. The production of even an experienced operator is limited and the cost of packing, therefore, forms an appreciable portion of the cost of the candy. Efforts have been made in the past to "set" the cups automatically, i. e., to present them to the operator one-by-one and face up, and to load the cups with candy automatically, but the prior devices, for the most part, have not been reliable or satisfactory.

Accordingly, it is an object of the invention to provide a method and apparatus for setting and loading paper cups which reduces the cost of the operation to a small fraction of the cost of manual labor, but which is, nevertheless, reliable and which insures accurate feeding of cups one-by-one and accurate, automatic placement of candy therein.

It is another object to provide a setting and loading machine which not only takes the place of an entire group of manual operators, but which may be easily reloaded with paper cups from time to time by an operator tending a battery of such machines.

It is a related object of the invention to provide a novel arrangement for determining exhaustion of cups from one portion of the reservoir or supply, and which is capable of switching automatically to a fresh reservoir or supply so as to avoid interruption of the continuous flow, without care or attention on the part of the operator. It is, moreover, an object to provide a setting and loading machine which is capable of continuous operation over long periods of time and in which there is no need to slow down or stop the machine for reloading with a stack of cups. Consequently, it is an object to provide a machine which is ideally suited for use in a continuous high-speed production line.

It is another object of the invention to provide a machine for placing candy in cups which enables the candy to be manufactured and boxed without at any time being touched by human hand and which is, therefore, more sanitary than the techniques conventionally used.

It is still another object to provide a setting and loading machine in which the two operations are tied together in a unique fashion to insure that a cup is properly placed and available for each piece of candy traveling on a

conveyer belt, but which avoids feeding more cups than candy.

It is also an object to provide a setting and loading machine in which the rate of feed, i. e., the spacing of the candy on the conveyer belt may be varied over wide limits while automatically maintaining a one-for-one discharge of cups. It is still another object to provide a novel control circuit for a device of the above character which precisely controls the operating cycle and which is automatically recycled by passage of the candy being processed.

It is an object of the invention, in one of its aspects, to provide a subassembly capable of high-speed setting of cups one-by-one, and which may be employed in other automatic environments or in a semi-manual set-up. When used for semi-manual loading, such subassembly is capable of increasing the output of an operator several fold since the operator can load two pieces of candy at one time. It is a related object to provide a cup setting subassembly in which the recycling may be triggered by convenient manual means as, for example, by a foot switch but which, subsequent to triggering, goes through a predetermined rapid operating cycle.

In another of its aspects, it is an object of the present invention to provide a loading subassembly which is capable of use in other automatic environments and semi-manual production lines, which utilizes the momentum of candy propelled at high speed from a conveyer belt or the like to accomplish loading but which is, nevertheless, capable of accurate placement of the candy within the cup without risk of damaging fragile pieces.

Finally, it is an object of the invention to provide a cup setting and loading machine which may be inexpensively constructed of standard and nonprecision parts, and which requires little or no maintenance, even when operated over long periods of time.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawings in which:

Figure 1 is a transverse, longitudinal section taken through the apparatus embodying the present invention along line 1—1 of Fig. 2.

Fig. 2 is a top view of the apparatus shown in Fig. 1.

Fig. 3 is a transverse vertical section taken along the line 3—3 in Fig. 2.

Fig. 4 is a schematic diagram of the electro-pneumatic circuit used for controlling the device in Figs. 1–3.

Fig. 4*a* shows a solenoid valve of the type disclosed in Fig. 4 in its energized position.

Figs. 5*a*–5*g* are a series of stop-motion views showing the cup-setting procedure used in the present device.

Figs. 6*a*, 6*b* and 6*c* are stop-motion views showing the loading of a piece of candy in a paper cup, characteristic of the present device.

Referring now to the drawings, Figs. 1–3 show side, top and rear views of a device constructed in accordance with the present invention. The "setting" portion of the device is indicated generally at **10** and the loading portion at **11**. Broadly stated, the function of the setting portion is to separate paper cups from a stack and to deliver them one-by-one, face up, to the loading portion of the device which deposits a piece of candy in each of the cups. Candy is fed to the setting and loading device via a conveyer belt **12** which is arranged horizontally and which is trained about a roller **13**. It will be assumed that means are provided "upstream" on the belt to deposit candy with the pieces spaced at intervals in the direction of travel. Means including a pulley **14** are provided for driving the belt in the direction shown.

Turning to the "setting" portion **10** of the apparatus, four mandrels **21–24** on a mandrel bar **20** are provided for receiving inverted stacks of cups. As stated, such

cups are frusto-conical in shape and are stamped and pleated in groups of about 50, using thin but relatively stiff "glassine" paper. Each of the mandrels **21–24** is shaped to conform to the inside dimensions of the stack so that the stack is held firmly in position as it is acted upon by the means to be described.

The mandrel bar **20** is slidably mounted on a platform **26**. The mandrels **21–24** are secured to the mandrel bar on pins, as for example, the pin **28** shown in Fig. 1, to permit easy replacement of the mandrels with a size corresponding to the size of cup being used.

Arranged above the respective mandrels on a frame **30** are friction fingers **31–34** having tips **31***a*–**34***a* made of rubber or the like.

In accordance with the present invention, means are provided for causing the friction fingers **31–34** to impart a wiping movement to the topmost ones of selected stacks of cups so that the topmost cup is removed laterally as well as inverted with respect to the remaining cups in the stack. As a result the cups are deposited face up on the platform **26** adjacent the mandrels **21–24**. In the illustrated embodiment, the friction fingers **31–34** are moved downwardly toward the mandrels by means of air cylinders **41–44** respectively. The air cylinders include springs **41***a*–**44***a* so that the fingers normally occupy an upraised position as shown in Fig. 3. When air is admitted to selected ones of said cylinders by means to be described, the corresponding friction fingers are brought downwardly into contact with the inverted stacks of cups with a force which depends upon the size of the cylinders and the applied air pressure. Preferably this pressure is subject to control by means of a regulator **46** of conventional design fed from a source of air **48**, the controlled air line being indicated at **49**.

For the purpose of moving the mandrels sideways relative to the friction fingers, an air cylinder **50** is used having a plunger **50***a* rigidly secured to the center of the mandrel bar **20**. The cylinder **50** has a first inlet line **51** for pushing the mandrel bar **20** forwardly and a second inlet line **52** at the other end for moving the mandrel bar into its retracted position indicated by the dotted outline in Fig. 1. To control the pressure to the cylinder **50** a separate regulator **53** is used feeding into a controlled air line **54**.

Prior to describing the control means used for selectively actuating the friction fingers, it will be helpful to have a general understanding of the procedure by which a single cup is dislodged from a stack of cups. Such procedure is set forth in a series of stop-motion views in Figs. *5a* to *5g* inclusive. In Fig. *5a* the mandrel **22** is taken as typical, cooperating with the friction finger **32** having a rubber tip **32***a*. In this series of figures, the inverted stack of cups is indicated at **45** and the topmost cup thereon at **45***a*. In operation, the finger **32** which is normally upraised descends as shown in Fig. *5b* into contact with the topmost cup **45***a*. Subsequently, the mandrel bar **20** begins to move in the retract direction as shown in Fig. *5c*. When this occurs, the topmost cup **45***a* must decide whether to remain seated on the stack or to move relatively with respect to the stack under the urging of the finger **32**. I have found that when transverse wiping movement is applied by a finger tipped with rubber or the like, the frictional force between the finger and the bottom of the topmost cup is sufficient to overcome the tendency for the cups to stick together. In dislodging a cup by wiping action, two forces must be overcome. The first is the frictional force between the cups and the second is the force resulting from the fact that the cups are intimately keyed together. The frictional force between the cups does not appear to be an appreciable factor in view of the fact that the cups are conventionally made of waxy "glassine" material which affords little resistance to relative sliding movement from cup to cup. However, for the cups to be "unkeyed" or moved out of register with one another requires that the top cup resiliently spread or yield by a small amount. After the top cup has been unseated as shown in Fig. *5c* the inclined side wall thereof tends to be cammed upwardly on the corner **45***b* of the stack **45**, thus urging the topmost cup **56** into the cocked position shown.

Upon continued retraction of the mandrel bar **20**, continued upward camming of the top cup at the point **45***b* occurs with lowering of the front edge of the cup, so that when the mandrel **22** is drawn clear of the friction finger as shown in Fig. *5d*, the topmost cup **45***a* will continue to rotate, here in a counterclockwise direction. Preferably, means are provided in the cylinders **41–44** for limiting the downward travel of the fingers to a point just slightly below the upper surface of the mandrel so that the respective fingers do not interfere with the free movement, Fig. *5e*, of the cup **45***a* as it turns right side side up. As a result, the cup **45***a* is deposited on the platform **26** below and alongside of the mandrel incident to the mandrel's being retracted. Preferably, the mandrels **21–24** overhang the mandrel bar **20** to provide a clearance space indicated at **47** in order to reduce the likelihood of interference with the righting of cups on the platform.

While the fingers are shown generally alined with the mandrels, the length of the wiping stroke may be increased or decreased slightly simply by changing the relation of the cylinders, forwardly or backwardly, relative to the supporting frame **30**. In the case of small cups, for example, a stroke somewhat more than one-half of the base diameter is desirable.

It is not practical to specify the force exerted by the friction fingers against the topmost cup during the sequence of operation detailed above. It will suffice to say that the force may be on the order of a pound or two and it will be apparent to one skilled in the art that the regulator **46** may be adjusted in order to produce optimum operation. The force is not critical of adjustment and rather board range will be found which is capable of producing reliable wiping and inversion of the cups so that they land one-by-one on the platform **26** during successive cycles of operation of the mandrel bar. It is believed that the action of the air on the presented surfaces of the dislodged cups and the position of the center of gravity therein contributes to the consistency and reliability of the operation. It is to be particularly noted that full righting takes place even though the vertical spacing between the mandrel and the platform **26** is severely limited.

Following deposit of the cup **45***a* on the platform **26**, successive advancement of the mandrel bar causes the cup **45***a* to be dislodged from the platform down a chute which is in alinement therewith. As seen in the top view of Fig. 2, two chutes are provided in the present embodiment which are indicated at **61**, **62** respectively, the chute **61** serving the mandrels **21**, **22** and the chute **62** serving the mandrels **23**, **24**.

Control circuit

The electro-pneumatic control circuit for selectively operating the friction fingers **31–34** and for cycling the mandrel bar **20** is shown in Fig. 4, with portions of the pneumatic system being shown in addition in Figs. 1–3. In the present arrangement a total of four solenoid valves are used indicated at **55–58**. These valves are shown schematically in Fig. 4 where it will be noted that each includes an electrical solenoid and slidable valve porting, movable between two positions. In one position of the valve, the connected cylinder is pressurized at controlled pressure from the air supply line. In the other position, the supply line is sealed off and the cylinder is connected to the atmosphere. Taking the solenoid valve **56** by way of example, it will be noted that it includes a coil **56***a* having an armature **56***b* and a slidable valve element **56***c* slidable in a casing **56***d*. When the coil **56***a* is not energized, which is the condition shown in Fig. 4, the mov-

able valve element 56c occupies its lower position in which the output line 52, connected to the cylinder 50, is open to atmosphere. When voltage is applied to the coil 56a, the valve member 56c is drawn upwardly so that air is supplied under pressure from the line 54 through the offset porting to the output line 52 (see Fig. 4a). The line 51 is simultaneously vented to atmosphere by the valve 55 which is energized at the same time as valve 56. It will be apparent upon inspection of Fig. 1 that application of pressure to the line 52 will cause the plunger of the cylinder to move in the retract direction.

The solenoid valves 57, 58 correspond to the valve 56, and corresponding lettering is employed for corresponding elements. However, in the case of the solenoid valves 57, 58 the outlet port indicated at 63 is connected to cylinders 42, 43 and the outlet port indicated at 64 is connected to the cylinders 41, 44. Thus it will be apparent that when the valve 57 is actuated, the friction fingers 32, 33 will be lowered in unison with one another. Similarly when the valve 58 is actuated, the friction fingers 31, 34 will be lowered in unison.

Prior to describing the control circuit shown in Fig. 4, it will be helpful to refer briefly to the relays and switches which it includes. The relays, which are preferably of the double pole, double throw type, are indicated as R1, R2, R3, and R4. The relay R1 has a first pole or contact 71 cooperating with a normally open contact 72, and a normally closed contact 73. The relay, in addition, has a second pole or contact 76 cooperating with a normally open contact 77 and a normally closed contact 78. Since all of the relays are identical, corresponding numbering, plus 10, is employed to represent the poles and contacts of the other relays. For the purpose of signaling arrival of the mandrel bar 20 at its forward position, a front position switch 110 is used having contacts 111, 112, and for signaling arrival of the mandrel bar at its rear position, a rear position switch 115 is used, the latter being of the single pole double throw type having a pole 116 and contacts 117, 118.

For the purpose of sensing the exhaustion of cups from the various mandrels, a set of check switches are employed as will be described in greater detail. These check switches are indicated at 121–124 inclusive and it will suffice for the present to say that each of the switches opens upon retraction of the mandrel bar when cups are in place upon the respective mandrels, but remains closed in the event that cups are missing.

For initiating operation of the control circuit, a cycle switch 126 is used which may, if desired, be manually operated. However, I prefer to initiate operation of the cycle automatically by passage of the candy along its path of movement on the belt 12 as is covered in a subsequent section. For the purpose of understanding the operation of the control circuit, it will be assumed that the cycle switch is manually closed. Current is supplied through the cycle switch and to the remainder of the control circuit from a voltage source 128 via a master switch 129.

Prior to reviewing the operating cycle of the control circuit, it is also of interest to inspect the physical mounting of the front and rear position switches 110, 115 which are engaged by the mandrel bar 20 as it slides on the platform 26 and which determine its extremes of movement. As most clearly seen in Fig. 1, the front position switch 110 has a plunger 110a which extends upwardly through an aperture provided in the platform 26. The arrangement is such that when the mandrel bar arrives at its forward position plunger 110a is pressed downwardly closing the contacts in the switch 110. Similarly, the rear position switch 115 has an upwardly extending plunger 115a which extends through an aperture in the platform. Thus, upon arrival of the mandrel bar 20 at its rear position, the switch 115 is "thrown," i. e., the contact 117 is broken and the contact 118 is "made." Preferably, the leading edges of the mandrel bar 20, engaging the plungers 110a, 115a are chamfered.

To begin the operating cycle, it will be assumed that the master switch 129 is closed, and that the cycle switch 126 is momentarily closed. It will, furthermore, be assumed that at the beginning of the cycle the mandrel bar 20 is at its forward position. In this position the front position switch 110 is closed which sends current from line 128 through normally closed contacts 71, 73 in relay R1 to solenoid valve 58 causing the fingers 41, 44 to be lowered into contact with the topmost cups on mandrels 21, 24 as previously described in connection with Fig. 5b. Closing of the cycle switch energizes the coil of relay R2 which seals itself in through its normally open contacts 86, 87 and through the normally closed contacts 116, 117 on the rear position switch, which are in turn connected to the supply line 128. Simultaneously current is supplied through lead 135 to energize the solenoid valves 55, 56. This current is supplied via contacts 86, 87 of relay R2 and contacts 116, 117 of the rear position switch. It will be noted that the valve ports in these two valves are oppositely arranged so that when the valves are de-energized air under pressure is applied through the air-line 51 to the cylinder 50 to hold it in its forward position. However, when voltage is applied to the two valves, air is supplied to the line 52 of the cylinder 50, the line 51 being vented to the atmosphere, so that the mandrel bar is rapidly retracted. During this retracting movement current continues to be applied to the valve 58 so that the friction fingers 31, 34 remain in contact with the cups in the outer stacks with the result that a cup is wiped from each of the outer stacks and deposited on the platform 26 as has been described in some detail in connection with Figs. 5a–5g.

When the mandrel bar reaches its rearmost position the contacts 116, 117 of the rear position switch 115 are broken, thereby breaking the sealing circuit of the relay R2 and causing the relay to drop out. This de-energizes the valve 58 so that the friction fingers 31, 34 are free to return to their upraised position under the action of the springs 41a, 44a. The valves 55, 56 are also de-energized with the result that line 51 is pressurized from the pressure supply line 54 to actuate the cylinder 50 in the forward direction. As the mandrel bar reaches its forward position, the cups previously deposited face-up on the platform 26 are shoved down the respective chutes 61, 62. This completes a normal operating cycle with the two outer friction fingers in active use. The result is to convey a pair of cups down respective chutes into loading stations in readiness to receive pieces of candy. The actual loading will be described at a later point. This cycle will be repeated as often as the cycle switch circuit is closed. In the above discussion it has been assumed that each of the mandrels has a full stack of cups and that the check switches 121–124 have all opened upon retraction of the mandrel bar. However, in accordance with one of the aspects of the invention check switches are used to determine exhaustion of cups from the "active" mandrels so that when exhaustion occurs the remaining pair of mandrels and their associated friction fingers are activated in order to insure an uninterrupted feeding of cups down the chutes 61, 62.

In order to understand the operation of the check switches, mention should first be made of their physical arrangement. Taking the check switch 122 associated with the mandrel 22 (Fig. 1) by way of example, it will be noted that it includes a feeler finger 122a which extends upwardly through an aperture provided in the platform 26. Positioned in alinement with the feeler finger 122a is a slot 22a formed in the mandrel 22. This slot is kept in alinement with the feeler finger by means of a pin 22b which is recessed into the mandrel bar 20 and thus keeps the mandrel from rotating. The check switch 122 is so arranged that when one or more cups are in place on the mandrel, the feeler finger is pushed back-

wardly to the position **131** opening the switch **122**. However, in the absence of any cups in the mandrel the feeler finger is received in the slot **22***a* and thus is pushed back only to the point **132**, which is not sufficient to open the switch contacts. The failure of these contacts to open is employed to operate the relay R1 to accomplish switching between a first condition in which the outer friction fingers **31, 34** are active and a second condition in which the inner friction fingers **32, 33** are active. The check switches used in association with the remaining mandrels are constructed in the same way and corresponding reference characters are employed.

Referring back to the control circuit shown in Fig. 4 it will be assumed that after about fifty cycles are completed the cups are exhausted on mandrel **24** so that the check switch **124** fails to open when the mandrel bar **20** reaches its fully retracted position. Although not previously mentioned, it will be seen from the circuit that arrival of the mandrel bar at its retracted position in addition to breaking the sealing circuit of relay R2, also closes the circuit to the coil of the relay R4 so that the latter is energized during the time that the mandrel bar is in its rear position. This closes the contacts **101, 102**, and **106, 107** in relay R4. Closure of the contacts **101, 102** furnishes current to the contacts of check switches **124** which have remained closed, as stated, because of the lack of cups on the mandrel **24**. The circuit is thus completed to the coil of the relay R1 which picks up and seals itself in through contacts **76, 77** thereon, the circuit being completed through contacts **91, 93** in relay R3. The effect of actuating relay R1 is that the contacts **71, 73** which formerly energized the valve **58** associated with the friction fingers **21, 24** are broken, and contacts **71, 72** on relay R1 are closed so that the valve **57** is energized for subsequent feeding of cups from the inner mandrels **22, 23**. This gives the operator tending the machine an opportunity to replenish the mandrels **21, 24** with a fresh stack of cups at her leisure during the next fifty cycles. It is to be noted that the switch contacts associated with the outer mandrels are connected in parallel so that failure of either of them to open is effective to produce the switching to the center mandrels upon the initial exhaustion of cups. The absence of cups is readily noted by the operator and the friction fingers are withdrawn to an out-of-the-way position so that it is a simple matter to replenish the exhausted cups while the machine is in operation and without affecting the steady flow of cups to the loading stations.

After another fifty or so operations the cups on one of the two center mandrels **22, 23** will be exhausted so that upon the "last" retraction of the mandrel bar, one of the two checks switches **122, 123** will remain closed thereby energizing the relay R3 which breaks the sealing circuit of the relay R1 causing the relay R1 to drop out. This restores the circuit to the initial condition with the two outer friction fingers activated by the valve **58** and with the two central friction fingers **22, 23** disabled by the de-energization of the valve **57**. This gives the operator an opportunity to replenish the cups stacked on the two mandrels **22, 23** so that they are ready to "take over" the continued feeding when the outer mandrels again become exhausted, all without interrupting the steady flow of cups to the loading stations.

Loading arrangement

In order to more fully understand how the setting and loading portions of the device cooperate with one another in order to produce the final result, more detailed reference will be made to the left hand portions of Figs. 1 and 2. Generally in alinement with the surface of the delivery belt **12**, preferably slightly below, is a delivery platform **140**. Recessed within the platform **140** closely adjacent the end of the belt are recesses **141, 142** alined with the chutes **61, 62** leading from the setting portion of the device. Each of these recesses has a lower floor **143, 144** respectively which is inclined upwardly in a direction away from the belt and which merges smoothly with the delivery platform **140** along the upper edge thereof. In short, the floors of the recesses **141, 142** are so oriented that when a paper cup is placed therein the more remote wall of the cup will be located directly in the path of movement of the candy fed from the belt **12**. The belt **12** is operated at a sufficient speed by the pulley **14** so that the momentum of the candy is sufficient to carry it across the delivery platform, picking up a cup end route. The manner in which the cup is picked up will be more readily understood by considering the stop motion views Figs. *6a*, *6b*, and *6c*. For purposes of explanation, a piece of candy **145** will be taken as representative. The piece of candy upon being ejected from the belt, retains its orientation, i. e., remains upright, striking the far wall of the paper cup **45***a*. Since the cup **45***a* is extremely light, it offers little or no resistance to the passage of the candy, and the cup thus tends to tip upwardly and out of the recess **143** as shown in Fig. *6b*. Subsequent motion of the candy in the cup, as shown in Fig. *6c*, carries the same across the delivery platform **140** ready for boxing. Conveniently, a chute **147** may be provided at the edge of the delivery platform and merging therewith so that the cup of candy is conveyed downwardly into a box loading station and where it may be loaded either automatically or manually. Preferably means are provided for adjusting the speed of the pulley and for adjusting the height of the platform so that the candy is forcibly propelled to the platform **140** without striking the edge of the recess. The adjustment of platform height is conveniently obtained by mounting the platform on one or more adjustable posts **148**.

In accordance with one of the aspects of the invention, means are provided for cycling the control circuit in accordance with the passage of candy along its path of movement. In the present instance this is accomplished by locating a photocell "upstream" on the belt **12** and by causing such photocell, upon passage of a piece of candy, to momentarily close the circuit of the cycling switch **126**. Referring to Fig. 2, the photocell indicated schematically at **150** receives a beam of light **151** from a light source **152**. The photocell is largely shielded from extraneous light by means of a hood **153** and a concentrating lens. Connected in series with the output of the photocell **150** is a normally closed relay **155** having contacts **156**. The photocell may be of the photo-resistive type supplied from a suitable current source **157**, and it will be apparent that as a piece of candy interrupts the light beam **151**, the relay **155** will be momentarily dropped out, thus closing the contacts **156** which are, as shown in Fig. 4, connected to the cycling circuit. In the present arrangement, two pieces of candy are normally fed side by side and thus a single interruption of the light beam is sufficient to cause discharge of two paper cups into the recesses **141, 142** at the loading station. It is not necessary, however, that the two pieces of candy be exactly alined with one another across the belt since the effective relay, for example relay R2, is put into operation and sealed in by its sealing circuit regardless of whether one impulse is received or two, from the photocell. It will be apparent to one skilled in the art that the photocell and light source may be located upstream on the belt **12** sufficiently far so as to insure that cups are fully seated in the recesses at the loading station by the time that the candy arrives.

Résumé of operation

While the operation of the device will be apparent from the foregoing description, it will be helpful to summarize it briefly as follows: With all of the mandrels loaded with stacks of cups and with the mandrel bar **20** in its forward position the switch **110** is closed thereby energizing valve **58** and lowering the fingers **31, 34** into contact with the

topmost cups on mandrels 21, 24 in readiness for an operating cycle. Passage of two generally alined pieces of candy on the belt 12 interrupts the beam of light, momentarily de-energizing the photocell and causing the relay 155 to drop out initiating operation of the control circuit. Simultaneously, valves 55, 56 are operated to pressurize the line 52 and to connect the line 51 to the atmosphere causing the mandrel bar to be retracted. The resulting wiping action of the friction fingers 31, 34 causes two cups to be deposited upon the platform 26. When the mandrel bar 20 reaches its retracted position, the rear position switch 115 causes the relay R2 to drop out thereby restoring the valves 55, 56 to their de-energized positions in which the valve 55 pressurizes the line 51 to return the mandrel bar 20 to its forward position. When the mandrel bar 20 reaches its forward position the two cups are dislodged, sliding down respective chutes 61, 62 into the respective recesses 141, 142 at the loading station. When the two pieces of candy 145 arrive at the end of the conveyer belt they are propelled into the awaiting cups, striking the far wall of each of the cups. Thereupon the cups tilt forwardly as set forth in Figs. 6*a*–6*c*, the momentum being sufficient to cause the cupped candy to slide across the delivery platform and down the chute 147 for loading into boxes.

Upon exhaustion of cups from either of the two outer mandrels, the corresponding check switches will fail to open, thereby energizing the coil of relay R1 so that the contact 73 is broken thereby disabling the two outer friction fingers, and the contact 72 is made thereby activating the two inner friction fingers 32, 33 without any interruption of the feed. When the cups on the central mandrels are exhausted, relay R3 is operated causing the relay R1 to drop out and restoring control to the relay R2 for continued feeding from the outer mandrels 21, 24.

In the above description and resume, it has been assumed that the photocell detector is located sufficiently "upstream" as to allow the cup setting means to complete its cycle and to deposit cups into the recesses at the loading station by the time that the candy arrives. This mode of operation has been described for the sake of simplicity and ready understanding. However, in most cases it will be desirable to use a conveyer belt which is just as short as possible and consequently the photocell detector will be positioned sufficiently close to the discharge end of the belt so as to permit the candy to pass across the delivery platform prior to the time that the setting device completes its cycle, picking up two cups which have been deposited in a preceding cycle. Where this mode of operation is employed it will, of course, be necessary to have two cups in position at the loading station in advance of initiating the first cycle.

While both the setting and loading portions of the device have been considered so revolutionary as to raise questions of operativeness, nevertheless, practical experience obtained with machines of the above design show that both operations and the combined automatic operation is carried out reliably even at a high rate of speed. It has been found that the speed can be adjusted to any rate up to about fifty pieces per station per minute and it is likely that this rate will be increased with additional experience and as the machine is still further improved.

While the present device includes only two loading stations it will be apparent that the number of loading stations may be increased simple by multiplication of the units already described and that similar machines may be used in multiple to achieve any desired rate of output. If desired, or instead of using the disclosure "double" arrangement which feeds two chutes, it will be apparent to one skilled in the art that the same control circuit could be used with a single arrangement formed by isolating the feeding elements used with a single chute, e. g., retaining mandrels 21 and 22 and eliminating mandrels 23 and 24. In this way a single photocell would be used for each row of candy on the belt which may be desirable under some circumstances.

The adjustments are not at all critical. The novel manner in which the portions of the machine are tied together to form an overall device insures that cups will be in readiness for candy delivered on the conveyor belt and that no more than one cup per piece will be furnished. A single operator can tend a battery of such machines operating at a high rate of speed since the automatic transfer from the outer mandrels to the inner, and vice versa, gives the operator plenty of time to replenish the exhausted mandrels. The machine is compact and inexpensive so that it may be used by even the smallest candy makers.

The present machine makes it possible for the first time, to carry candy from the stage of raw materials to the point of boxing "untouched by human hands."

While the device which has been described herein provides complete automatic cupping, it will be apparent that the cupping and loading portions of the device comprise subassemblies which have independent utility. For example, the setting device may be used in a semi-manual production line to present two cups face up to an operator, enabling the operator to use both hands in removing candy from the conveyor belt and thereby doubling the operator's production. When the setting subassembly is thus used, the cycling switch 126 may be conveniently foot-operated so that the operator need simply to touch a foot switch in order to bring two additional cups into loading position. When the device is used in this way, all of the other features, including the automatic transfer from exhausted mandrels to fresh mandrels are equally useful and effective.

It will also be apparent that the loading portion of the device forms a subassembly having separate utility, since the principle of loading may be used independently of the particular setting means which is employed to deposit cups in the recesses at the loading station. In a semi-manual operation the cups may, for example, be placed in recesses manually. This separate utility of the subassemblies in no way detracts from the overall utility of the combined device.

As one skilled in the art will appreciate, the delivery means, which in the present instance comprises the conveyer belt 12, may be upwardly tilted without departing from the present invention.

And while the invention has been described above in connection with loading of candy, nevertheless, it will be apparent that other confections may be so loaded for packing in boxes. Furthermore, the device is useful outside of the confectionery industry and will find application wherever it is desired to separately cup small elements at a high rate of speed.

I claim as my invention:

1. In a confectionery cup-setting machine for feeding pleated cups from a tightly packed stack, the combination comprising, a mandrel for receiving an inverted stack of cups and conforming to the bottom dimension thereof, a friction finger located above the mandrel, means for moving the mandrel and friction finger relative to one another so that a transverse wiping movement is applied to the presented end of the topmost cup in the stack tending to slide the cup horizontally from said stack while applying a component of rotary movement thereto, a platform adjacent to and a short distance below the mandrel for receiving the displaced cup face-up, a loading station for holding the cup in position for receiving a piece of candy or the like, and means for laterally dislodging said cup face-up from said platform into the loading station.

2. In a confectionery cup-setting machine for feeding pleated cups from a tightly packed stack, the combination comprising, a mandrel for receiving an inverted stack of cups and conforming to the bottom dimension thereof, a friction finger located above the mandrel, means for moving the mandrel and friction finger relative to one

another so that a transverse wiping movement is applied to the presented end of the topmost cup in the stack, tending to slide the cup horizontally from said stack while applying a component of rotary movement thereto, a platform adjacent to and a short distance below the mandrel for receiving the displaced cup face-up.

3. The method of denesting stacked and pleated paper cups which comprises positioning an inverted stack over an elevated mandrel, engaging the top of the inverted stack with a friction member, moving the mandrel transversely relative to the friction member to dislodge the topmost cup from the inverted stack while maintaining the friction member pressed thereagainst so that the cup undergoes rotation in addition to lateral translation and permitting the dislodged cup to fall from the elevated mandrel and upright itself incident to continued rotation.

4. In a confectionery cup-setting machine for feeding pleated cups from a tightly packed stack, the combination comprising, a mandrel for receiving an inverted stack of cups, a friction finger mounted above the topmost cup, means for relatively moving the friction finger and mandrel toward one another for engagement of the topmost cup by the friction finger, and means for thereafter moving said friction finger and said mandrel transversely relative to one another while maintaining the friction finger in contact with the topmost one of the cups whereby said topmost cup is subjected to a relative wiping movement causing said cup to undergo rotary movement as well as translational movement, the transverse relative movement between the friction finger and the mandrel being continued to a point in which the friction finger is clear of the mandrel to permit the cup to settle face-up, and a platform below the level of the mandrel for receiving the cup face-up.

5. In a confectionery cup-setting machine for feeding pleated cups from a tightly packed stack, the combination comprising, a mandrel of frusto-conical shape for snugly holding a stack of closely packed pleated cups in inverted position, a vertically movable friction finger mounted above the mandrel and having a friction tip for engaging the presented bottom of the topmost cup in the stack, means for horizontally moving the mandrel between a forward position in which the mandrel is generally alined with the tip on the friction finger and a retracted position in which the mandrel is drawn clear of the friction finger, means for cycling the transverse movement of the mandrel between such positions, said cycling means including means for lowering said friction finger into contact with the topmost cup incident to arrival of the mandrel at its forward position and for maintaining the friction finger in such lowered position during the initial portion of the retracting movement of the mandrel so that a transverse wiping engagement is applied to the topmost cup causing it to be separated from the remainder of the cups in the stack with a rotational component of movement so that the cup is discharged in face-up position adjacent said mandrel, a loading station for candy or the like, and means for conveying the cup face-up to said loading station.

6. In a confectionery setting and loading machine for loading candy or the like into individual paper cups, the combination comprising, a mandrel for snugly receiving an inverted stack of pleated cups, a conveyer belt for conveying pieces of candy spaced thereon, a loading station at the end of said conveyer belt, means including a friction finger for imparting a wiping movement to the end of the topmost inverted cup for separating such cup from the stack and for toppling the same into face-up position, means for transporting such cup face-up to the loading station in position to receive a piece of candy forcibly propelled from the end of said belt, and means triggered by the passage of the candy along its path of movement for recycling the action of the friction finger.

7. In a confectionery setting and loading machine for loading pieces of confection or the like into individual paper cups, the combination comprising, a mandrel for snugly receiving an inverted stack of pleated cups, conveyer means for conveying the pieces of confection spaced thereon, a loading station at the end of said conveyer means, means including a friction finger for imparting a wiping movement to the end of the topmost inverted cup for separating such cup from the stack and for toppling the same into face-up position, means for transporting such cup face-up to the loading station in position to receive a piece of confection forcibly propelled from the end of said conveyer means, and means triggered by the passage of the confection along its path of movement for recycling the action of the friction finger means.

8. In a confectionery setting and loading machine for loading pieces of confection or the like into individual paper cups, the combination comprising, a mandrel for snugly receiving an inverted stack of pleated cups, conveyer means for conveying the pieces of confection spaced thereon, a loading station at the end of said conveyer means, means including a friction finger for imparting a wiping movement to the end of the topmost inverted cup for separating such cup from the stack and for toppling the same into face-up position, and means for transporting such cup face-up to the loading station in position to receive a piece of candy forcibly propelled from the end of said conveyer means.

9. In a confectionery cup-setting machine for feeding pleated cups from a tightly packed stack, the combination comprising, first and second mandrels arranged side by side for supporting inverted stacks of cups respectively, a receiving platform adjacent said mandrels, means including first and second friction fingers arranged above said mandrels respectively for wipingly engaging the topmost cups so that the topmost cups are separated from the stack and discharged face-up on said receiving platform, a candy loading station having provision for receiving a cup face-up for reception of candy therein, means for conveying the cups from said platform to said loading station, means for abling said first friction finger and for disabling the second friction finger so that cups are fed only from said first mandrel and means for detecting the exhaustion of the cups on said first mandrel for abling said second friction finger and for disabling the first friction finger so as to produce feeding of an unbroken stream of cups to said loading station, the friction finger being withdrawn sufficiently from the mandrels when disabled as to permit replacement of cups on the exhausted mandrel.

10. In a confectionery cup-setting machine for feeding pleated cups from a tightly packed stack, the combination comprising, first and second mandrels arranged side by side for supporting inverted stacks of cups respectively, a receiving platform adjacent said mandrels, means including first and second friction fingers arranged above said mandrels respectively for wipingly engaging the topmost cups so that the topmost cups are separated from the stack and discharged face-up on said receiving platform, and means for abling said first friction finger and for disabling the second friction finger so that cups are fed only from said first mandrel, and means for detecting the exhaustion of the cups on said first mandrel for abling said second friction finger and for disabling the first friction finger so as to produce feeding of an unbroken stream of cups to said loading station.

11. In a confectionery loading machine for loading a series of objects into individual paper cups, the combination comprising, means including a conveyer for propelling the objects generally horizontally from the end thereof, a delivery platform at the end of said conveyer and at a slightly lower level, means providing a recess between the platform and the conveyer, means for supporting a cup in the recess with the bottom surface angled upwardly in the direction of travel of the objects with the far side of the cup in the trajectory thereof so that the momentum carries the cup from the recess onto said delivery platform.

12. In a loading machine for loading a series of objects into individual paper cups, the combination comprising, means including a conveyer for propelling the objects generally horizontally from the end thereof, a delivery platform at the end of said conveyer and at a slightly lower level, means providing a recess between the platform and the conveyer, means for supporting a cup in the recess with the bottom surface of the cup angled upwardly in the direction of travel of the objects with the far side of the cup in the trajectory thereof so that the momentum carries the cup from the recess onto said delivery platform, and means triggered by the movement of each of said objects for depositing a cup in said recess.

13. In a loading machine for loading a series of objects

into individual paper cups, the combination comprising, means including a conveyer for propelling the objects generally horizontally from the end thereof, a delivery platform at the end of said conveyer and at a slightly lower level, means providing a recess between the platform and the conveyer, means for supporting a cup in the recess with the bottom surface of the cup angled downwardly from the level of the platform and with the far side of the cup in the trajectory so that the momentum of the object striking the cup tips the cup upwardly out of the recess and so that the cup and object as a unit slide onto said delivery platform.

No references cited.