March 12, 1968 L. RODE 3,373,052

METHOD AND APPARATUS FOR FEEDING PASTE IN CIGARETTE MACHINES AND THE LIKE

Filed March 12, 1964 2 Sheets-Sheet 1

Fig. 1

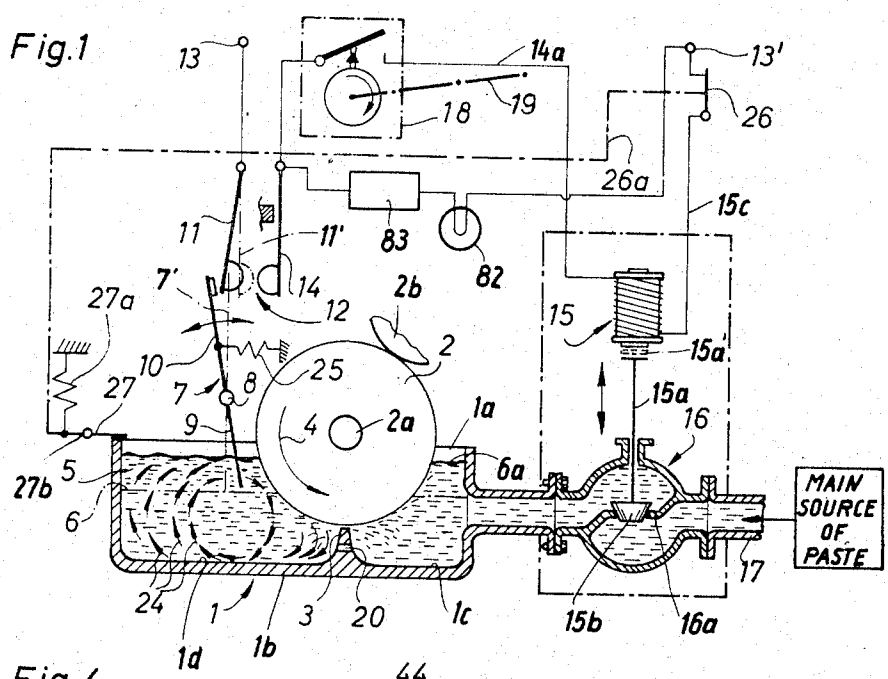
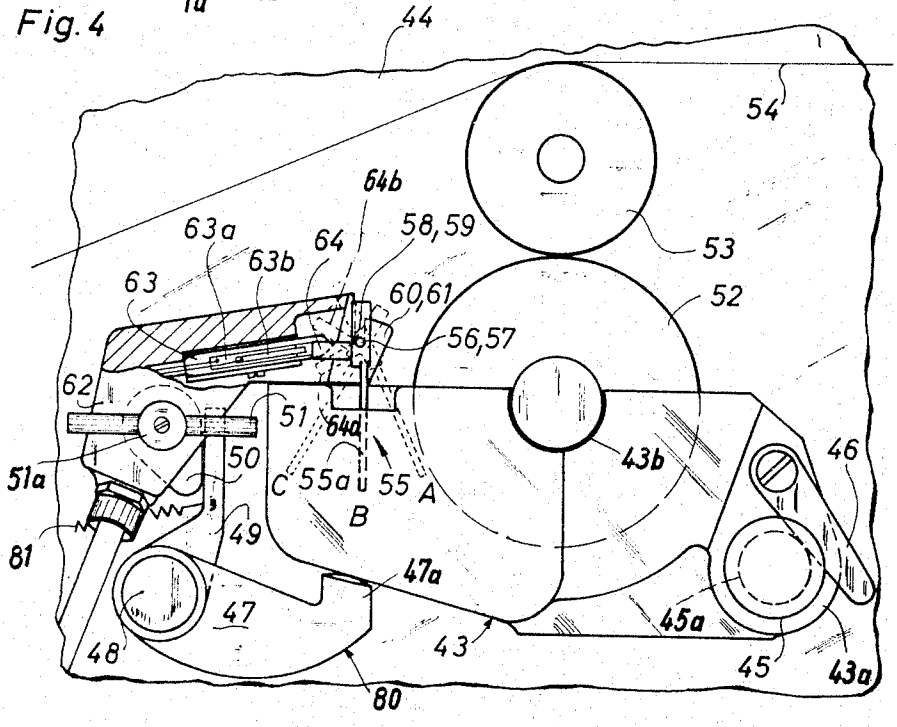


Fig. 4



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2 Sheets-Sheet 2

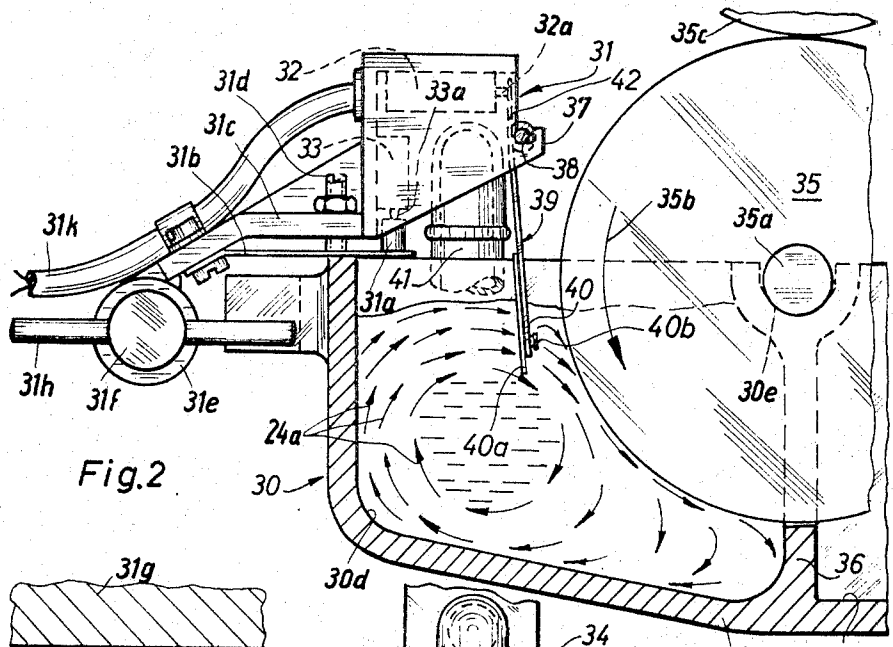


Fig.2

Fig.3

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METHOD AND APPARATUS FOR FEEDING PASTE IN CIGARETTE MACHINES AND THE LIKE

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26 Claims. (Cl. 117—111)

ABSTRACT OF THE DISCLOSURE

A minimum supply of paste in a paste tank is maintained by a feeler which dips into the supply of paste and changes its position in response to changes in the strength of a current produced by agitation of the supply of liquid, such agitation being produced by the paste-withdrawing roller or by an independent agitating device. The feeler can effect generation of visible or otherwise detectable signals or it controls the operation of a valve which admits fresh paste when the strength of the current is reduced to an extent which indicates that the supply of liquid has decreased below a minimum permissible value.

The present invention relates to pasters for cigarette machines or the like, and more particularly to a method and apparatus for regulating the admission of liquid or liquefied adhesive (hereinafter called paste) to paste applying apparatus in such machines. Still more particularly, the invention relates to a method and apparatus for regulating the admission of paste to the container of a cigarette machine or a similar machine in which paste is continuously withdrawn from a container for application to a running web of paper or the like.

It is common practice to equip a cigarette machine with a paste applying apparatus which serves to partially coat one side of a cigarette paper web or to coat one side of a wrapper for filter mouthpieces so that such webs and wrappers may be wrapped around a tobacco rod or around groups of cigarettes and filter mouthpieces. A serious drawback of presently utilized pasters is that they occupy too much space and/or that they cannot prevent crusting when the paste is exposed to atmospheric air.

Accordingly, it is an important object of my invention to provide a simple, compact and fully automatic paster for use in cigarette machines and the like, and to construct the paster in such a way that the formation of crust is avoided even though the paste may remain exposed to atmospheric air.

Another object of the invention is to provide a method of regulating the admission of paste to a container from which the paste is removed for application to a web of cigarette paper or the like.

A further object of the invention is to provide a novel method of maintaining a minimum supply of viscous paste or a similar liquid in a comparatively small container from which the liquid is being withdrawn at a substantially constant rate so that the container must receive fresh liquid at frequent intervals.

An additional object of the invention is to provide an improved paster for use in tobacco processing machines or the like wherein the element or elements which serve to withdraw paste from a container may also serve to initiate intermittent admission of fresh paste so that the container always accommodates a predetermined supply of paste.

Still another object of my invention is to provide a paster of the just outlined characteristics wherein the intervals at which the container should receive fresh paste

are automatically reported to the operator so that the operator may initiate admission of fresh paste or that the operator may inspect the paster with a view to determine whether or not the admission of fresh paste took place in a fully automatic way.

A concomitant object of the invention is to provide a novel sensing device which is capable of automatically detecting the exact level of paste in the container and of initiating the generation of visible, audible or otherwise detectable signals when the container should receive fresh paste.

Another object of my invention is to provide a paster which is automatically prevented from receiving fresh paste when its container is improperly mounted in the machine and/or when the machine is not operated at normal speed.

Still another object of the invention is to provide a paster wherein the generation of readily detectable signals takes place simultaneously with automatic admission of fresh paste.

With the above objects in view, one feature of my invention resides in the provision of a method of maintaining a minimum supply of liquid in a container from which such liquid is being withdrawn at a substantially constant rate so that the liquid level in the container descends gradually and approaches a minimum level. The method comprises three basic steps including agitating the contents of the container to produce a current whose strength decreases at the rate at which the liquid level descends in response to withdrawal of such liquid from the container, measuring the strength of the current, and admitting fresh liquid when the result of such measurement indicates that the remaining liquid fills the container to a predetermined minimum level.

The current may be produced by a revolving agitator which is placed into the container, and such current produces impulses of diminishing magnitude whereby an impulse of given magnitude may be used to initiate admission of fresh liquid into the container, for example, by allowing or by causing a normally open electric switch to close and to complete the circuit of an electromagnetic valve which automatically admits fresh liquid from a main source.

Alternatively, the impulses generated by the current may serve to normally prevent the generation of a visible, audible or otherwise detectable signal, but to allow the generation of such signal when the strength of the current decreases to a value which corresponds to a predetermined minimum liquid level in the container. The operator in charge of the machine is then warned that the container must receive fresh liquid. If desired, both methods may be utilized simultaneously so that the current generated by a suitable agitator may produce impluses which automatically initiate admission of fresh liquid and which simultaneously initiate the generation of a readly detectable signal. The device for agitating the liquid may also serve as a means for gradually withdrawing such liquid from the container.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved paster itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawings, in which:

FIG. 1 is a side elevational view of a paster which embodies one form of my invention, the container and the valve being shown in vertical section;

FIG. 2 is a fragmentary side elevational view of a modified paster with the container shown in vertical section;

FIG. 3 is a top plan view of the structure shown in FIG. 2; and

FIG. 4 is a side elevational view of a third paster.

Referring to FIG. 1, there is illustrated a paster which is utilized for applying paste to a web of cigarette paper in a cigarette machine, not shown. The paster comprises a container 1 here shown as a tank having an open top and side walls 1*a* which support the shaft 2*a* of a driven transfer roller 2. The lower portion of this roller dips into a supply of paste 5 which is accommodated in the tank 1 and the upper portion of the roller 2 serves to transfer a film of paste onto a roller-shaped applicator 2*b* which is in direct contact with one side of a paper web, not shown.

The bottom wall 1*b* of the tank 1 is formed with a transverse partition 3 which extends upwardly in close proximity of the transfer roller 2. This roller is driven by a suitable transmission, not shown, from the main drive shaft 19 of the cigarette machine so as to rotate in a counterclockwise direction (arrow 4). The minimum permissible level of the paste 5 is indicated by a phantom line 6, and the exact position of this minimum level depends on the diameter and mounting of the transfer roller 3, i.e., this roller must dip into the paste to such an extent that a given portion of its peripheral surface remains in continuous contact with the contents of the tank 1. In addition, the roller 2 must dip into the paste to such an extent that it produces a circular current which serves to control the position of a sensing element 7, hereinafter called feeler, which dips into the paste and which is rockable about the axis of a fixed horizontal pivot 8. The feeler 7 resembles a two-armed lever having a lower arm 9 which extends into the paste and an upper arm 10 which is biased by a resilient element here shown as a helical spring 25.

The arm 9 may resemble a fork or blade and may consist of plate-like or liquid-permeable material, e.g., a network of crossing wires or the like. The lower end of the arm 9 normally extends to a level somewhat above the minimum level 6. The upper end of the arm 10 abuts against a movable contact 11 of a normally open microswitch 12 which also includes a fixed contact 14. The arm 10 may be integral with the contact 11, and this contact is connected with one terminal 13 of a source of electrical energy. The spring 25 biases the arm 10 in a sense to rock the feeler 7 in a clockwise direction so that, whenever the feeler is free to follow the bias of the spring 25, its upper arm 10 deflects the contact 11 to the phantom-line position 11' in which the microswitch 12 completes an electric circuit to initiate admission of fresh paste into the tank 1. The contact 14 is connected with one end of the coil in an electromagnet 15. The core of this electromagnet is stationary and is arranged to attract a reciprocable armature 15*a* which carries a valve member 15*b* serving to normally prevent flow of paste through a valve 16. The valve is connected with a supply conduit 17 leading to the main source of paste and with the tank 1 so that, when the core of the electromagnet 15 attracts the armature 15*a*, the valve member 15*b* moves away from its seat 16*a* and allows fresh paste to flow from the main source and into the right-hand compartment 1*c* of the tank 1. The other end of the energizing coil of the electromagnet 15 is connected to the second terminal 13' of the current source. It will be noted that the switch 12 and electromagnet 15 together constitute an actuating device for the valve 16, and this actuating device is responsive to movement of the feeler 7 to a position 7' when the strength of the current decreases in response to descent of paste 5 to the minimum level.

The conductor 14*a* which connects the contact 14 of the microswitch 12 with the coil of the electromagnet 15 contains an electric control switch 18 which opens or closes in dependency on the r.p.m. of the main shaft 19 of the cigarette machine. The function of the switch 18 is to open the electric connection between the microswitch 12 and electromagnet 15 when the cigarette machine is operated at low speed or when the machine is idle, and to allow the current to flow through the conductor 14*a* when the machine operates at normal speed. Such switches are well known in the art and, therefore, the exact construction of the control switch 18 forms no part of the present invention.

The paster of FIG. 1 comprises a second control switch 26, here shown as a microswitch, which is installed in the conductor 15*c* connecting the coil of the electromagnet 15 with the terminal 13' and which may be actuated by remote control (see the phantom line 26*a*) from an actuating member 27 which is pivotable at 27*b* and which is biased by a spring 27*a* so as to normally abut against the top face of the tank 1. The microswitch 26 is normally closed but opens automatically when the spring 27*a* is free to rotate the actuating member 27 in a clockwise direction in response to removal of the tank 1 from its customary position.

The valve 16 is normally closed and, when the cigarette machine operates at normal speed, the switches 18, 26 are closed but the switch 12 remains open excepting when the tank 1 should receive a fresh supply of paste. In order to insure that the freshly admitted paste may rapidly enter the left-hand compartment 1*d* of the tank 1, the partition 3 is formed with one or more passages 20 which are preferably located close to the bottom wall 1*b*, i.e., the compartments 1*c*, 1*d* are in permanent communication with each other.

The paster of FIG. 1 operates as follows:

It is assumed that the tank 1 contains an adequate supply of paste 5 which fills the compartments 1*c*, 1*d* up to a level 6*a* which is substantially above the minimum level 6. The roller 2 is driven by the main shaft 19 to rotate in a counterclockwise direction (arrow 4) and to produce a circular current which is indicated by the arrows 24. Thus, the roller 2 actually constitutes an agitator which stirs up the contents of the compartment 1*d* and produces a current whose strength decreases at the rate at which the liquid level descends in response to withdrawal of paste from the tank 1. This current flows in a direction which is perpendicular to the axis of the pivot 8 and impinges against the left-hand side of the lower arm 9 so that it expands the spring 25 and allows the contact 11 to remain spaced from the contact 14. The microswitch 12 is open and the electromagnet 15 is deenergized so that the valve member 15*b* rests against its seat 16*a* and prevents inflow of fresh paste into the compartment 1*c*. The switches 18 and 26 are closed because the tank 1 is properly mounted in the cigarette machine and because the machine operates at normal speed.

As the roller 2 continues to withdraw paste from the compartment 1*c*, the level of paste 5 sinks and, at a certain stage of the operation, the strength of the current 24 decreases sufficiently to allow the feeler 9 to take the phantom-line position 7' in which the upper arm 10 closes the microswitch 12 to energize the electromagnet 15 and to open the valve 16 because the core of the electromagnet attracts the armature 15*a* which then rises to the phantom-line position 15*a*'. The admission of fresh paste through the valve 16 is terminated when the strength of the current 24 increases sufficiently to return the feeler 7 to the full-line position of FIG. 1 in which the upper arm 10 allows the contact 11 to move away from the contact 14 and to open the circuit of the electromagnet 15. The passages or passages 20 will allow for rapid inflow of fresh paste into the lefthand compartment 1*d* but will delay such equalization of levels in the compartments 1*c*, 1*d* for an interval of time which is sufficient to insure that the valve 16 admits an adequate supply of fresh paste.

If the cigarette machine is arrested, the switch 18 opens in a fully automatic way and prevents energization of the electromagnet 15 even if the body of paste 5 descends to the minimum level 6. In other words, and since the

roller 2 is preferably driven by the main shaft 19, the closing of the switch 12 cannot result in admission of additional paste as long as the switch 18 is open. This will be readily understood since, when the roller 2 comes to a halt or rotates at reduced speed, the strength of the current 24 decreases even if the supply of paste is sufficient to fill the compartments 1c, 1d to a level well above the minimum level 6. In other words, the switch 12 may close for a number of reasons (namely, when the level of paste 5 descends to or approaches the minimum level 6, when the r.p.m. of the roller 2 is reduced sufficiently to produce a weak current 24 even if the level of paste is well above the minimum level 6, and when the roller 2 is arrested), but the switch 12 will cause admission of fresh paste only when the r.p.m. of the main shaft 19 is sufficiently high to keep the switch 18 closed. The switch 18 controls because its closing is a prerequisite for admission of fresh paste via valve 16.

If the operator decides to remove the tank 1 for the purpose of cleaning or for another reason, the spring 27a automatically turns the actuating member 27 in a clockwise direction to open the microswitch 26 and to prevent opening of the valve 16 even though the spring 25 is then free to close the switch 12 through the intermediary of the feeler 7 In other words, the paster of FIG. 1 will admit a fresh supply of paste only when all of the switches 12, 18, 26 are closed which means that the tank 1 must be properly mounted in the frame of the cigarette machine, that the main shaft 19 must rotate at a given speed which is sufficient to keep the switch 18 closed as well as to rotate the roller 2 at a speed which is sufficient to produce a current 24 of requisite strength, and that the level of paste in the compartment 1d must sink sufficiently to allow for closing of the switch 12.

The spring 25 insures that the switch 12 closes without delay as soon as the strength of the current 24 decreases in response to descent of paste to a level at which the tank 1 should receive fresh paste.

FIG. 1 further illustrates a signal generating device 82 which is connected in series with the microswitch 12 and which produces a readily detectable signal as soon as the switch 12 closes. This signal generating device 82 is shown as a lamp which may light up when the roller 2 rotates at less than necessary speed, when the roller 2 is arrested, and/or when the valve 16 should admit additional paste. Thus, it could happen that the armature 15a jams in the housing of the valve 16 and cannot open the path for admission of fresh paste from the main source. If the operator notes that the lamp 82 is on for a longer period of time, he is warned that the paster does not operate in the required manner. The conductor between the contact 14 and the lamp 82 is preferably connected with a time-lag relay 83 so that the lamp lights up only after elapse of an interval of time which normally suffices to allow for refilling the tank when the valve 16 operates properly. Thus, if the paster of FIG. 1 does not operate properly, the signal produced by the lamp 82 indicates to the operator that the paster requires inspection or repair.

Of course, the paster of FIG. 1 may be simplified by providing a manually operated valve which is opened by hand when the operator notes that the lamp 82 is on. Such simplified paster may operate without the electromagnet 15, without the relay 83, and without switches 18, 26. Of course, all the feeler 7 then does is to measure the strength of the current 24 and to produce an impulse for a signal without, however, automatically starting the admission of fresh paste into the compartment 1c. In other words, the feeler 7 measures the strength of the current 24 and causes a detectable signal to be generated by the lamp 82 and/or it causes the switch 12 to initiate admission of fresh paste when the result of such measurement indicates that the remaining paste fills the tank 1 to a minimum level.

FIGS. 2 and 3 illustrate a modified paster which includes a container in the form of a tank 30 having an open top and supporting a switch housing 31 which accommodates two microswitches 32, 33 and preferably an electromagnet to actuate a valve 34 serving to control the admission of fresh paste into the tank 30. In the illustrated embodiment, the valve 34 is adjacent to one side wall 30a of the tank and is mounted in a supply conduit 41 whose outlet extends into the compartment 30d. The shaft 35a of a transfer roller 35 rests in suitable cutouts 30e provided in the top faces of the side walls 30a and is driven by the main shaft of a cigarette machine so as to rotate in a counterclockwise direction (arrow 35b). The bottom wall 30b of the tank 30 is provided with a transverse partition 36 which extends close to the periphery of the roller 35 and which also extends along the end faces of this roller so that the right-hand compartment 30c need not receive any paste.

That side of the switch housing 31 which is adjacent to the roller 35 is provided with a supporting device including two aligned bearing brackets 37 having recesses 38 to receive the end portions 39a, 39b of a horizontal pivot for a feeler 39. Thus, the entire feeler may be readily lifted out of its supports. This feeler comprises a first portion or carrier 40 which is secured to the end portions 39a, 39b of the pivot, and a second portion here shown as a baffle plate 40a which is adjustably fixed to the lower portion of the carrier by one or more screws 40b or similar fasteners. Such adjustability of the baffle plate 40a enables an operator to select the optimum level to which the feeler 39 may extend into the compartment 30d. For example, the baffle plate 40a will be adjusted to account for changes in the viscosity of paste in the tank 30.

The microswitch 32 is held in open position by the upwardly extending arm 42 of the carrier 40 when the strength of the current 24a suffices to depress a spring-biased trip 32a which extends into the path of the arm 42. This normally open microswitch 32 is analogous to and performs the same function as the switch 12 of FIG. 1, namely, it allows the valve 34 to admit a supply of fresh paste via conduit 41 when the strength of the current 24a is insufficient to keep the switch 32 open. The carrier 40 then pivots in a clockwise direction, as viewed in FIG. 2 and allows the trip 32a to follow the bias of its spring in order to complete the circuit which controls the valve 34.

The second microswitch 33 corresponds to the control switch 26 of FIG. 1 and is connected in series with the switch 32. It is normally closed by a projection or head 31a provided at one end of a leaf spring 31b secured to an outwardly extending flange 31c of the housing 31. The head 31a bears against a spring-biased trip 33a of the switch 33. An adjustable bolt 31d serves to arrest the head 31a at a minimum distance from the switch 33 which is closed as long as the trip 33a is depressed by the head 31a, i.e., as long as the spring 31b rests on the top face of the tank 30 and as long as the switch housing 31 remains in the position of FIGS. 2 and 3.

The flange 31c is secured to a sleeve 31e mounted on a horizontal spindle 31f which is rotatable in the frame 31g of the cigarette machine. The spindle 31g may be rotated by a handle 31h and carries a cam 31j which may be rotated to extend into a bifurcated lug 30f of the tank 30. A flexible cable 31k accommodates the conductors connecting the switches 32, 33 with the electromagnet (not shown) of the valve 34 and with a source of electrical energy. If desired, the switches 32, 33 may be connected in series with a third switch corresponding to the control switch 18 of FIG. 1.

If the operator desires to remove the feeler 39, the end portions 39a, 39b of its pivot are simply lifted out of the recesses 38 so that the feeler may be cleaned or that the operator may adjust the position of the baffle plate 40a with reference to the carrier 40.

If the operator wishes to remove the tank 30 without removing the switch housing 31, the handle 31*h* is turned in a counterclockwise direction, as viewed in FIG. 2, whereby a radial stud 31*m* on the spindle 31*f* engages a shoulder 31*n* on the sleeve 31*e* and turns the entire switch housing 31 to a level above the tank 30 by simultaneously withdrawing the cam 31*j* from the lug 30*f* so that the tank may be removed from the machine. The valve 34 need not be permanently connected with the tank 30 as long as the outlet of the conduit 41 discharges into the compartment 30*d* when the tank is in the position of FIG. 2 or 3. When the switch housing 31 is pivoted upwardly and away from the tank 30, the spring 31*b* moves the head 31*a* away from the trip 33*a* and the switch 33 opens to prevent admission of paste into the compartment 30*d* even if the switch 32 is closed. The screw 31*d* insures that the head 31*a* cannot break the switch 33 and at the same time serves to locate the switch housing 31 with reference to the tank, i.e., to make sure that the feeler 39 descends to a predetermined level such as is selected by adjustment of the baffle plate 40*a*.

If the operator wishes to remove the switch housing 31 from the cigarette machine, the handle 31*h* is rotated in a counterclockwise direction until the switch housing rises above the top face of the tank 30 and the cam 31*j* moves out of the gap between the prongs of the lug 30*f*. The spindle 31*f* is thereupon simply withdrawn from the socket 31*p* which is secured to the frame 31*g*. The purpose of the cam 31j is to insure that the feeler 39 is centered between the end faces of the roller 35 when the tank 30 is properly mounted in the machine and when the cam 31*j* enters the gap between the prongs of the lug 30*f*.

Another very important function of the feeler 7 or 39 is that it prevents crusting of paste in the tank 1 or 3. Thus, the roller 2 or 35 generates a current 24 or 24*a* regardless of the presence of the feeler, and the feeler creates additional disturbance which is particularly felt in the compartment 1*d* or 30*d* to prevent deposition of dried paste on the feeler with attendant reduction in the sensitivity of the apparatus.

The value 34 may communicate with a source of compressed paste or with a source which delivers paste by gravity feed.

The roller 35 delivers a film of paste to the periphery of a roller-shaped applicator 35*c* which comes in direct contact with a web of cigarette paper or the like. The partition 36 is sufficiently close to the periphery of the roller 35 to serve as an equalizing device in that it removes excess paste from the roller 35 whereby the periphery of the applicator 35*c* receives a film of constant thickness. If desired, a portion of the applicator 35*c* may be accommodated in the compartment 30*c*. In certain instances, the paster may comprise two or more intermediate rollers which receive films of paste from the transfer roller 35 and transmit it to the applicator. It is also possible to omit the applicator 35*c* and to bring a web of cigarette paper or similar wrapper material in direct contact with the roller 35. Thus, this roller can perform as many as four different functions including agitating the paste to generate the current 24*a*, preventing crusting of paste in the compartment 30*d*, continuously withdrawing paste from the tank 30, and applying paste to a web of paper or the like.

Referring finally to FIG. 4, there is illustrated a third paster which includes a container 43 here shown as a tank having an open top. This tank is rockable about the axis of a horizontal shaft 45 which is secured to the frame 44 of a cigarette machine and which allows a sleeve 43*a* of the tank to slide in the axial direction upon lifting of a locking lever 46 which normally extends into a circumferential groove 45*a* of the shaft 45. The sleeve 43*a* is rigid with the right-hand end wall of the tank 43. The left-hand portion of the tank rests on a bell crank lever 80 which is rockable about the axis of a horizontal shaft 48 mounted on the frame 44. The lever 80 comprises a substantially horizontal arm 47 having a nose 47*a* which abuts against the underside of the tank 43, and an upwardly extending arm 49 which abuts against a cam 50. The arm 49 is biased by a spring 81 which is anchored in the frame 44 and tends to rotate the lever 80 in a counterclockwise direction, as viewed in FIG 4, so that the arm 49 remains in abutment with the cam 50. This cam is connected with a horizontal spindle 51*a* which is rotatable in the frame 44 and carries a handle 51. The spindle 51*a* is held by friction so that the cam 50 may resist the bias of the spring 81 unless the handle 51 is turned by hand or by means of a suitable tool, not shown. The parts 45, 48, 80, 81, 50, 51 and 51*a* together constitute a support which serves to retain the tank in the position of FIG. 4 and which allows rapid and convenient removal or reinsertion of the tank in the frame of a cigarette machine.

The side walls of the tank 43 are provided with cutouts 43*b* for the shaft 52*a* of a transfer roller 52 which transfers a continuous film of paste to the periphery of a roller-shaped applicator 53. The latter is in contact with the underside of a web 54 of cigarette paper which is being fed into the rod forming mechanism of the cigarette machine in a manner well known in the art. If the paster of FIG. 4 is installed in a filter cigarette machine, the applicator 53 may coat one side of a web which serves to connect filter mouthpieces with the end portions of coaxial cigarette rods.

The roller 52 also performs the function of an agitator and creates a current (not shown) which normally deflects the lower arm 55*a* of a feeler 55 so that this lower arm takes the position A in which it is deflected in a direction toward the periphery of the roller 52. The arm 55*a* remains in the position A when the roller 52 is driven at requisite speed and when the tank 43 contains a requisite quantity of paste. This arm 55*a* resembles a blade whose concave side is turned in a direction to the left, as viewed in FIG 4, so that the feeler is even more sensitive and reacts in response to generation of rather weak currents. The upper arm 64 of the feeler 55 resembles a rod and constitues a permanent magnet which remains in the position 64*a* when the lower arm 55*a* remains in the position A. The feeler 55 further comprises a horizontal pintle or pivot having two end portions 56, 57 which are received in aligned recesses 58, 59 of two bearing brackets 60, 61 provided on a switch housing 62. This housing 62 is nonrotatably fixed to the spindle 51*a*. If the spindle 51*a* is rotated in a counterclockwise direction, the feeler 55 is lifted out of the interior of the tank 43 and the tank is simultaneously caused to pivot in a counterclockwise direction because the spring 81 tends to maintain the arm 49 of the bell crank 80 in abutment with the cam 50 which rocks the lever 80 in a clockwise direction. In other words, merely by turning the handle 51 in a counterclockwise direction, the operator may withdraw the feeler 55 and simultaneously moves the roller 52 away from the applicator 53 so that the tank may be removed from the apparatus after the operator lifts the lever 46 to allow for axial movement of the sleeve 43*a* along the shaft 45.

The housing 62 accommodates a special electric switch 63 which performs the same function as the switch 12 of FIG. 1, namely, to complete the circuit of an electromagnetic valve as soon as the current produced in the paste by the roller 35 cannot prevent the arm 55*a* from leaving the position A and from moving toward or beyond a position B. The position B corresponds to that position into which the lower arm 55*a* of the feeler 55 moves by gravity when the roller 52 is idle, i.e., when this roller fails to create a current, and also when the level of paste in the tank 43 descends below the lower end of the feeler.

The switch 63 comprises a casing which is filled with an inert gas and which accommodates two contacts 63*a*, 63*b*. These contacts are normally spaced from each other so that the switch 63 is normally open. However, when

the arm 55*a* moves to the position B which corresponds to the full-line position of the permanent magnet 64, the latter causes the contacts 63*a*, 63*b* to close the switch 63 and to initiate admission of fresh paste into the tank 43. As explained above, the arm 55*a* moves to the position B when the roller 52 is arrested, when the roller 52 rotates at low speed so that it cannot produce a current of requisite strength even though the tank 43 may accommodate a sufficient quantity of paste, or when the level of paste in the tank 43 descends below a minimum level. The valve which is controlled by the switch 63 is not shown in FIG. 4.

The lower arm 55*a* of the feeler 55 is moved to a third position C when the operator moves the feeler 55 upwardly and away from the tank 43. The permanent magnet 64 then moves to the position 64*b* which, insofar as the switch 63 is concerned, corresponds to the position 64*a* because the switch is then open and prevents admission of fresh paste. It will be noted that the switch 63 performs a dual function including that of the control switch 26 and that of the switch 12. Thus, when the switch housing 62 is moved away from the tank 43, the switch 63 automatically opens the circuit of the valve because the magnet 64 moves to the position 64*b* in which the magnet cannot keep the contacts 63*a*, 63*b* closed. When the strength of the current in the tank 43 decreases or when the current is non-existent, the feeler 55 moves its arm 55*a* to the position B and the valve admits paste because the switch 63 is then closed. In the position A of the lower arm 55*a*, the feeler 55 holds the magnet in the position 64*a* in which the magnet allows the switch 63 to remain open and thus prevents admission of paste into the tank 43.

It is to be understood that the switches 32, 63 of FIGS. 2–3 and 4 may serve to complete the circuit of a lamp or another signal generating device simultaneously with or instead of opening a valve which admits paste into the tank 30 or 43. In other words, the lamp 82 of FIG. 1 may be installed in each of the pasters shown in FIGS. 2–3 and 4 whereby such lamp may constitute an additional safety feature or it may serve as a substitute for the valve 34 of FIGS. 2–3 or for the non-illustrated valve which is controlled by the switch 63 of FIG. 4.

It is to be noted that the paster of my invention may be utilized in machines other than those serving for the manufacture of tobacco-containing products, for example, in labelling machines, in packaging machines and in all other machines wherein the supply of paste or the like must be replenished at regular or irregular intervals, either automatically or by manually controlled valves. Based on my own experience, the paster of this invention is especially suited for use in mass-producing cigarette machines and filter cigarette machines of recent construction which are intended to operate at high speed and without frequent interruptions, and wherein the space is at a premium so that there is no room to accommodate a large tank such as could supply paste throughout a complete work shift. Furthermore, large tanks are aften undesirable because the paste has a tendency to form a crust. The main source of paste (shown in FIG. 1) can be installed at a considerable distance from the machine, together with the valve which admits paste to the tank. In other words, the paster may be constructed as a very compact unit which can be readily installed in many existing machines and which can be transferred from an idle machine to a machine which is to be put to actual use. Such transfer of the paster may be effected without complicated tools and with little loss in time.

If desired, the tank may be heated to avoid caking. Also, the device which agitates the paste to produce currents for deflecting the feeler when the paster is in use may be a separate part which has nothing to do with continuous withdrawal of paste from the tank. Thus, the shaft of the transfer roller 2, 35 or 52 may drive a separate agitator which produces the currents 24 or 24*a* so that the transfer roller need not be mounted close to the feeler. All such modifications are so obvious that a person with ordinary skill in the art will have no difficulty understanding them without additional illustrations. However, the construction which is actually shown in the drawings is normally preferred because the transfer roller is ideally suited to perform the dual function of withdrawing paste and of simultaneously agitating the contents of the tank so as to produce a current which will control the position of the feeler.

Common to all embodiments of my invention is the novel feature that the strength of currents, produced in the body of liquid in a comparatively small tank of the paster, may be measured by a movable sensing device which initiates the generation of impulses and/or signals when the body of liquid descends to a minimum level. Thus, the paste itself is the originator of impulses which may be used to maintain a minimum supply in the container.

The operation of the paster is not affected by the presence of contaminants, such as particles of solid matter which might be contained in the body of liquid or which might be deposited therein from the surrounding air, Also, the paster is not affected appreciably by the presence of agglomerated paste in the container regardless of whether such agglomerations develop in or on the surface of the liquid body.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of this invention and, therefore such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A method of maintaining a minimum supply of liquid in a container of predetermined capacity from which such liquid is being withdrawn at a substantially constant rate so that the liquid level in the container descends gradually and approaches a minimum level simultaneously with decreasing supply of liquid in the container, particularly for maintaining a supply of viscous paste in containers of pasters of tobacco processing machines, comprising the steps of agitating the contents of the container to produce a current whose strength decreases at the rate at which the supply of liquid decreases in response to withdrawal of liquid from the container; sensing the decrease of strength of said current below a preselected value corresponding to a predetermined minimum supply of liquid; and generating a signal as the result of said sensing.

2. A method of maintaining a minimum supply of liquid in a container of predetermined capacity from which such liquid is being withdrawn at a substantially constant rate so that the liquid level in the container descends gradually and approaches a minimum level, simultaneously with decreasing supply of liquid in the container, particularly for maintaining a supply of viscous paste in containers of pasters for tobacco processing machines, comprising the steps of agitating the contents of the container to produce a current whose strength decreases at the rate at which the supply of liquid decreases and which produces impulses of diminishing magnitude in response to withdrawal of liquid from the container; sensing the decrease of strength of said current below a preselected value corresponding to a predetermined minimum supply of liquid; generating a signal as the results of said sensing; and utilizing said signal to initiate admission of fresh liquid so that the supply of liquid is increased when the supply of liquid has decreased to said predetermined minimum supply.

3. A method of maintaining a minimum supply of liquid in a container of predetermined capacity, particularly for maintaining a supply of viscous paste in containers of pasters for tobacco processing machines, comprising

the steps of withdrawing the liquid at a substantially constant rate so that the liquid level in the container descends gradually and approaches a minimum level simultaneously with decreasing supply of liquid in the container; simultaneously agitating the contents of the container to produce a current whose strength decreases at the rate at which the supply of liquid decreases in response to withdrawal of liquid from the container; sensing the decrease of strength of said current below a preselected value corresponding to a predetermined minimum supply of liquid; generating a signal as the result of said sensing; and utilizing said signal to initiate admission of fresh liquid so that the supply of liquid is increased when the supply of liquid has decreased to said predetermined minimum supply.

4. A method of maintaining a minimum supply of liquid in a container of predetermined capacity from which such liquid is being withdrawn at a substantially constant rate so that the liquid level in the container descends gradually and approaches a minimum level simultaneously with decreasing supply of liquid in the container, particularly for maintaining a supply of viscous paste in containers of pasters for tobacco processing machines, comprising the steps of agitating the contents of the container to product a current whose strength decreases at the rate at which the supply of liquid decreases in response to withdrawal of liquid from the container; sensing the decrease of strength of said current below a preselected value corresponding to a predetermined minimum supply of liquid; generating a signal as the result of said sensing; and utilizing said signal to initiate admission of fresh liquid so that the supply of liquid is increased when the supply of liquid has decreased to said predetermined minimum supply.

5. In an apparatus for feeding a liquid at a substantially constant rate, particularly for feeding paste in tobacco processing machines or the like, in combination, a liquid-containing tank of unchanging capacity wherein the liquid level descends gradually and approaches a minimum level in response to substantially continuous withdrawal of liquid simultaneously with decreasing supply of liquid in the tank; agitator means arranged to dip into and to produce in the body of liquid in said tank a current whose strength decreases at the rate at which the supply of liquid decreases in response to withdrawal of liquid from said tank; and sensing means movable between a plurality of positions and extending into said liquid-containing tank so as to project into said body of liquid in which said current is produced and to normally remain in a first position when said current is produced in said body of liquid which contains more than a minimum supply of liquid and to move to a second position when the strength of said current decreases in response to a reduction in the supply of liquid below a predetermined minimum value so that said sensing means reaches said second position when the tank should receive fresh liquid.

6. In an apparatus for feeding a liquid at a substantially constant rate, particularly for feeding paste in tobacco processing machines or the like, in combination, a liquid-containing tank of unchanging capacity wherein the liquid level descends gradually and approaches a minimum level in response to substantially continuous withdrawal of liquid; agitator means arranged to dip into and to produce in the body of liquid a current whose strength decreases at the rate at which the liquid level descends in response to withdrawal of liquid from said tank simultaneously with decreasing supply of liquid in the tank; sensing means movable between a plurality of positions and extending into said liquid-containing tank so as to project into said body of liquid in which said current is produced and to normally remain in a first position when said current is produced in said body of liquid which contains more than a minimum supply of liquid and to move to a second position when the strength of said current decreases in response to a reduction in the supply of liquid below a predetermined minimum value so that said sensing means reaches said second position when the tank should receive fresh liquid; and signal generating means operatively connected with said sensing means and arranged to produce a signal in response to movement of said sensing means to said second position thereof.

7. In an apparatus for feeding a liquid at a substantially constant rate; particularly for feeding paste in tobacco processing machines or the like, in combination, a liquid-containing tank of unchanging capacity wherein the liquid level descends gradually and approaches a minimum level in response to substantially continuous withdrawal of liquid simultaneously with decreasing supply of liquid in the tank; agitator means arranged to dip into and to produce in the body of liquid in said tank a current whose strength decreases at the rate at which the supply of liquid decreases in response to withdrawal of liquid from said tank; sensing means movable between a plurality of positions and extending into said liquid-containing tank so as to project into said body of liquid in which said current is produced and to normally remain in a first position when said current is produced in said body of liquid which contains more than a minimum supply of liquid and to move to a second position when the strength of said current decreases in response to a reduction of the supply of liquid below a predetermined minimum value so that said sensing means reaches said second position when the tank should receive fresh liquid; a main source of liquid; conduit means connecting said main source with said tank; normally closed valve means provided in said conduit means; and actuating means arranged to open said valve means in response to movement of said sensing means to said second position thereof so that said tank automatically receives fresh liquid from said main source when said body of liquid in said tank contains less than said minimum supply of liquid.

8. A combination as set forth in claim 7, wherein said actuating means comprises a normally open electric microswitch arranged to close in response to movement of said sensing means to second position and an electromagnet connected in circuit with said microswitch and arranged to open said valve when said microswitch completes said circuit, said microswitch comprising a pair of normally spaced contacts and said sensing means comprising a two-armed lever arranged to pivot about a fixed axis, one arm of said lever extending into said current and the other arm of said lever being adjacent to one of said contacts, said actuating means further comprising resilient means arranged to bias said other arm against said one contact with a force which is sufficient to close said microswitch when the strength of said current decreases in response to a reduction in the supply of liquid below said minimum value.

9. In an apparatus for feeding a liquid at a substantially constant rate, particularly for feeding paste in tobacco processing machines or the like, in combination, a liquid tank of unchanging capacity; a driven roller dipping into said tank and arranged to withdraw liquid at a substantially constant rate so that the level of descending liquid approaches a minimum level simultaneously with decreasing supply of liquid in the tank, and to simultaneously agitate the body of liquid in said tank for producing in the liquid a current whose strength decreases at the rate at which the supply of liquid decreases in response to withdrawal of liquid from said tank; and sensing means movable between a plurality of positions and extending into said liquid-containing tank so as to project into said body of liquid in which said current is produced and to normally remain in a first position when said current is produced in said body of liquid which contains more than a predetermined minimum supply of liquid and to move to a second position when the strength of said current decreases in response to a reduction in the supply of liquid below a predetermined minimum level so that said sensing means reaches said second position when the tank should receive fresh liquid.

10. A combination as set forth in claim 9, wherein said tank comprises a partition extending in close proximity of said roller and dividing the interior of said tank into a pair of compartments one of which accommodates said body of liquid, said one compartment being located ahead of the other compartment as seen in the direction in which said roller rotates.

11. A combination as set forth in claim 10, wherein said partition is arranged to equalize the layer of liquid which is withdrawn by said roller and to prevent a flow of liquid into said other compartment.

12. A combination as set forth in claim 10, wherein said other compartment is free of liquid when said roller is in a normal position with reference to said tank, said roller being movable to another position in which the liquid overflows said partition and is intercepted in said other compartment.

13. A combination as set forth in claim 10, further comprising a main source of liquid, conduit means connecting said main source with said one compartment, and normally closed valve means provided in said conduit means and arranged to open in response to movement of said sensing means to said second position thereof so that said one compartment receives fresh liquid from said source when the liquid descends to said minimum level.

14. A combination as set forth in claim 9, wherein said tank comprises a partition extending in close proximity of the periphery of said roller and dividing the interior of said tank into a pair of communicating compartments one of which receives a portion of said sensing means, and further comprising a main source of liquid, conduit means connecting said main source with the other compartment, and normally closed valve means provided in said conduit means and arranged to open in response to movement of said sensing means to said second position thereof so that said compartments receive fresh liquid when the remaining liquid descends to said minimum level.

15. A combination as set forth in claim 14, wherein said partition is provided with at least one passage to permit rapid equalization of liquid levels in said compartments.

16. In an apparatus for feeding a liquid at a substantially constant rate, particularly for feeding paste in tobacco processing machines or the like, in combination, a liquid-containing tank of unchanging capacity wherein the liquid level descends gradually and approaches a minimum level in response to substantially continuous withdrawal of liquid simultaneously with decreasing supply of liquid in the tank; agitator means arranged to dip into and to produce in the body of liquid in said tank a current whose strength decreases at the rate at which the supply of liquid decreases in response to withdrawal of liquid from said tank; and sensing means comprising a lever extending into said liquid-containing tank so as to project into said body of liquid in which said current is produced and pivot means supporting said lever for movement about a fixed axis which is substantially perpendicular to the direction of said current, said lever being movable between a plurality of positions and normally remaining in a first position when said current is produced in said body of liquid which contains more than a minimum supply of liquid, said lever being moved to a second position when the strength of said current decreases in response to a reduction in the supply of liquid below a predetermined minimum value so that said lever reaches said second position when the tank should receive fresh liquid.

17. A combination as set forth in claim 16, wherein said lever comprises a first arm which dips into the liquid and second arm, and further comprising a main source of liquid, conduit means connecting said main source with said tank, normally closed valve means provided in said conduit means, and actuating means operatively associated with said second arm and arranged to open said valve means when said lever moves to said second position thereof.

18. In an apparatus for feeding a liquid at a substantially constant rate, particularly for feeding paste in tobacco processing machines or the like, in combination, a liquid-containing tank of unchanging capacity wherein the liquid level descends gradually and approaches a minimum level in response to substantially continuous withdrawal of liquid simultaneously with decreasing supply of liquid in the tank; agitator means arranged to dip into and to produce in the body of liquid in said tank a current whose strength decreases at the rate at which the supply of liquid decreases in response to withdrawal of liquid from said tank; sensing means movable between a plurality of positions and extending into said liquid-containing tank so as to project into said body of liquid in which said current is produced and to normally remain in a first position when said current is produced in said body of liquid which contains more than a predetermined minimum supply of liquid and to move to a second position when the strength of said current decreases in response to a reduction in the supply of liquid below a predetermined minimum value so that said sensing means reaches said second position when the tank should receive fresh liquid; a main source of liquid; conduit means connecting said main source with said tank; normally closed valve means arranged to open in response to movement of said sensing means to said second position thereof so that said tank receives fresh liquid from said main source when the supply of liquid in said tank decreases below said predetermined minimum value; and control means operatively connected with said tank and arranged to prevent opening of said valve means when the tank is out of position.

19. In an apparatus for feeding a liquid at a substantially constant rate, particularly for feeding paste in tobacco processing machines or the like, in combination, frame means; a liquid-containing tank of unchanging capacity wherein the liquid level descends gradually and approaches a minimum level in response to substantially continuous withdrawal of liquid simultaneously with decreasing supply of liquid in the tank, said tank being detachably supported by said frame means; agitator means arranged to dip into and to produce in the body of liquid in said tank a current whose strength decreases at the rate at which the supply of liquid decreases in response to withdrawal of liquid from said tank; and sensing means movable between a plurality of positions and extending into said liquid-containing tank so as to project into said body of liquid in which said current is produced and to normally remain in a first position when said current is produced in said body of liquid which contains more than a predetermined minimum supply of liquid and to move to a second position when the strength of said current decreases in response to reduction of the supply of liquid below a predetermined minimum value so that said sensing means reaches said second position when the tank should receive fresh liquid, said sensing means being detachably supported by said frame means.

20. In an apparatus for feeding a liquid at a substantially constant rate, particularly for feeding paste in tobacco processing machines or the like, wherein a tank contains a supply of liquid whose level descends gradually and approaches a minimum level in response to substantially continuous withdrawal of liquid and wherein an agitator means is arranged to dip into and to produce in the liquid a current whose strength decreases at the rate at which the liquid level descends in response to withdrawal of liquid from the tank, the improvement which consists in the provision of sensing means comprising a lever extending into the current and pivot means supporting said lever for movement about a fixed axis which is substantially perpendicular to the direction of the current, said lever being movable between a plurality of positions and normally remaining in a first position when the current is produced in a body of liquid which extends above the minimum level, said lever being moved to a second posi-

tion when the strength of the current decreases in response to descent of liquid to the minimum level so that said lever reaches said second position when the tank should receive fresh liquid, said lever comprising a first portion secured to said pivot means and a second portion adjustably secured to said first portion to provide variation of the depth to which said lever extends into the current.

21. In an apparatus for feeding a liquid at a substantially constant rate, particularly for feeding paste in tobacco processing machines or the like, in combination, a liquid-containing tank wherein the liquid level descends gradually and approaches a minimum level in response to substantially continuous withdrawal of liquid; agitator means arranged to dip into and to produce in the liquid a current whose strength decreases at the rate at which the liquid level descends in response to withdrawal of liquid from said tank; sensing means comprising a lever extending into said current and pivot means supporting said lever for movement about a fixed axis which is substantially perpendicular to the direction of said current, said lever being movable between a plurality of positions and normally remaining in a first position when said current is produced in a body of liquid which extends above said minimum level, said lever being moved to a second position when the strength of said current decreases in response to descent of liquid to said minimum level so that said lever reaches said second position when the tank should receive fresh liquid; and supporting means located above said tank and provided with upwardly open notch-like recesses for receiving and gravitationally retaining portions of said pivot means so that said lever may be readily detached from said supporting means.

22. In an apparatus for feeding a liquid at a substantially constant rate, particularly for feeding paste in tobacco processing machines or the like, in combination, a liquid-containing tank wherein the liquid level descends gradually and approaches a minimum level in response to substantially continuous withdrawal of liquid; agitator means arranged to dip into and to produce in the liquid a current whose strength decreases at the rate at which the liquid level descends in response to withdrawal of liquid from said tank, said agitator means being constituted by a driven roller which withdraws liquid at a substantially constant rate in response to rotation thereof; sensing means comprising a lever having a first arm extending into said current and a second arm, and pivot means supporting said lever for movement about a fixed axis which is substantially perpendicular to the direction of said current, said lever being movable between a plurality of positions and normally remaining in a first position when said current is produced in a body of liquid which extends above said minimum level, said lever being moved to a second position when the strength of said current decreases in response to descent of liquid to said minimum level so that said lever reaches said second position when said tank should receive fresh liquid; a main source of liquid; conduit means connecting said main source with said tank; normally closed valve means provided in said conduit means; actuating means operatively associated with said second arm and arranged to open said valve means when said lever moves to second position; and control means responsive to rotation of said roller and arranged to prevent opening of said valve means when the rotational speed of said roller decreases below a predetermined speed and when said roller is idle.

23. A combination as set forth in claim 22, wherein said control means comprises a normally closed electric switch and wherein said actuating means comprises a normally open switch connected in series with said normally closed switch and arranged to be closed by said second arm in the second position of said lever, and an electromagnet connected in series with said switches and arranged to open said valve when said normally open switch is closed, said normally closed switch being arranged to open in response to a reduction in the rotational speed of said roller below said predetermined speed.

24. In an apparatus for feeding a liquid at a substantially constant rate, particularly for feeding paste in tobacco processing machines or the like, in combination, frame means; a liquid-containing tank wherein the liquid level descends gradually and approaches a minimum level in response to substantially continuous withdrawal of liquid, said tank having an open top and being detachably supported by said frame means; agitator means arranged to dip into and to produce in the liquid a current whose strength decreases at the rate at which the liquid level descends in response to withdrawal of liquid from said tank; sensing means movable between a plurality of positions and normally extending through the open top and into the interior of said tank and into said current so as to normally remain in a first position when said current is produced in a body of liquid which extends above said minimum level and to move to a second position when the strength of said current decreases in response to descent of liquid to said minimum level so that said sensing means reaches said second position when the tank should receive fresh liquid, said sensing means being detachably supported by said frame means; a spindle rotatably supported by said frame means; and a housing arranged to rotate with said spindle and connected with said sensing means, said spindle being arranged to lift said sensing means out of said tank in response to rotation in one direction and to introduce said sensing means into said tank in response to rotation in the opposite direction.

25. A combination as set forth in claim 24, further comprising a main source of liquid, conduit means connecting said main source with said tank, normally closed valve means provided in said conduit means, and actuating means including electric switch means provided in said housing and arranged to open said valve means in response to movement of said sensing means to said second position thereof.

26. A combination as set forth in claim 25, wherein said actuating means comprises control means arranged to prevent opening of said valve means when said tank is out of position with reference to said frame means.

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