

Nov. 13, 1962

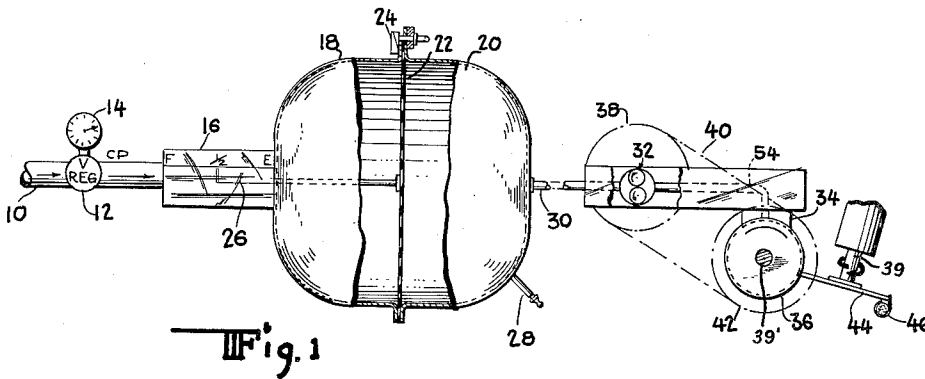
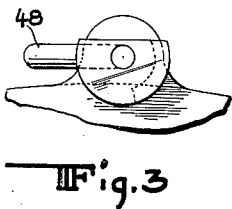
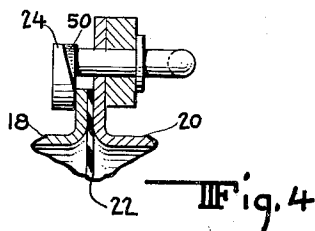
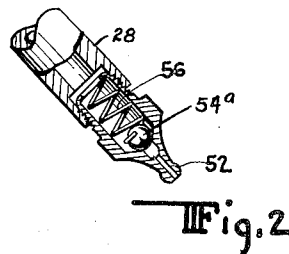
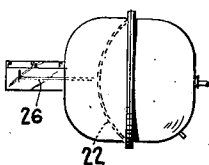
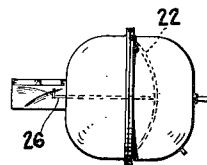
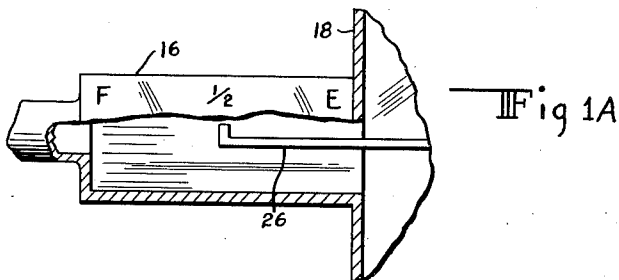
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PASTER FOR CIGARETTE MACHINES

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

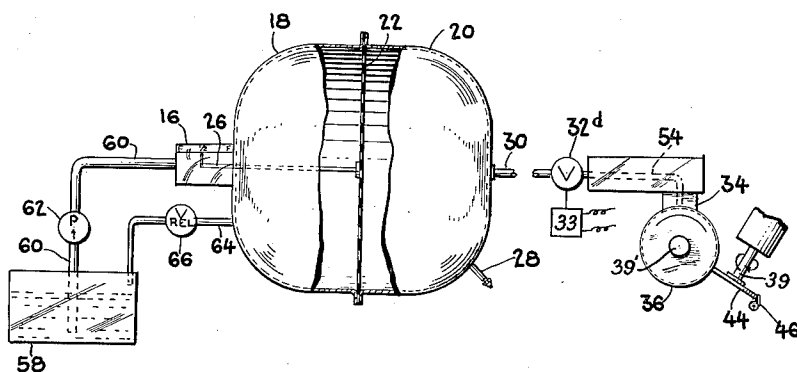


Fig. 7

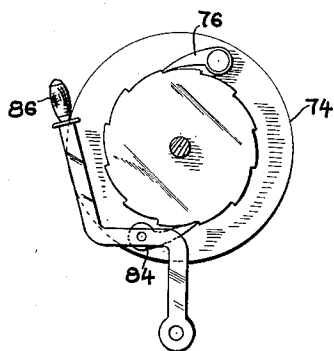


Fig. 9

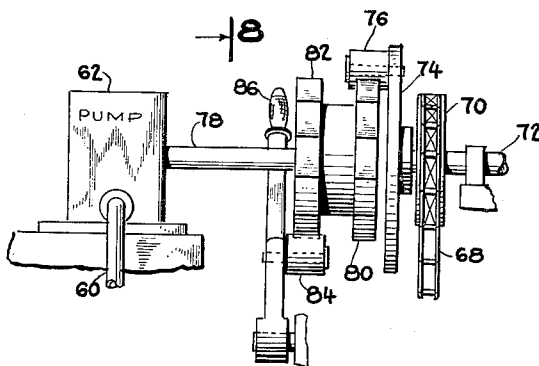


Fig. 8

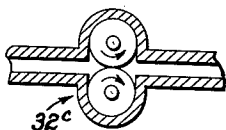


Fig. 10

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## PASTER FOR CIGARETTE MACHINES

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This invention relates to paste-applying apparatus for cigarette making machines, and more particularly to containers and means for feeding paste from containers to the applying apparatus in such mechanisms.

In one broad class of such paste applying devices, it is a common practice to supply the paste in separate containers. These containers are mounted in the mechanism and paste is extruded therefrom by means of a piston which may be actuated by a variety of methods. With this system, it is necessary to stop the cigarette-making machine to replace the paste container when it is empty. This involves removing the empty container, readjusting the pressure applying apparatus to accommodate a filled container, fitting a filled container into the mechanism, and again readjusting the pressure applying device to the working position before the machine is ready to start. This involves loss of production whilst the machine is being prepared to accept a filled paste container. It also necessitates a double supply of containers, one being in use on the machine, while the other is being cleaned and refilled.

It is the frequent practice to arrange the change from empty to filled containers at a specified time of day in order to minimize down time. This invariably involves changing containers before the old ones are empty and wasting whatever paste they may contain, for it is not practical to refill dirty, part empty containers.

One of the objects of this invention is to provide a paste applying mechanism, the container of which may be replenished with paste whilst the machine is in operation.

Another object of this invention is to eliminate the necessity for transporting the individual paste containers to separate machines.

Another object of this invention is to make possible the replacement of paste in the container of the paste applying mechanism without interfering with the normal production of the machine.

Another object of this invention is to make possible the refilling of the paste container of a paste applying apparatus before that container is empty so that the paste not yet consumed at that time is still available for consumption.

Another object of this invention is to provide means for feeding paste from a closed container by means of fluid pressure.

Another object of this invention is to provide means whereby pressure is maintained on the paste contained in the apparatus when the machine is at rest so that said paste may be ready for instantaneous feeding the instant the machine is put into motion.

Another object of this invention is to provide an extensible and collapsible separator diaphragm between the paste to be fed and the pressure applying means used to feed the paste.

Another object of this invention is to provide means to indicate the quantity of paste remaining in the mechanism at all times.

Other objects and features of the invention will appear as the description of the particular physical embodiments selected to illustrate the invention progress. In the accompanying drawings which form a part of this specification, like characters or reference have been applied to corresponding parts throughout the several views which make up the drawings.

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FIGURE 1 is a diagrammatic view partly in section of a side elevation of one form of the mechanism.

FIGURE 1A is an enlarged view of the indicator shown in FIG. 1.

FIGURE 2 is an enlarged view of the filling connection shown on FIGURE 1.

FIGURE 3 shows one form of quick release clamping device suitable for use in holding together the parts shown in FIGURE 1.

FIGURE 4 shows a side elevation of the clamping device, FIGURE 3.

FIGURE 5 shows diagrammatically the position of the extensible and collapsible separator when the container is approximately two-thirds filled with paste.

FIGURE 6 shows the same extensible and collapsible divider in the position it would occupy when the container is approximately one-third filled with paste.

FIGURE 7 shows a diagrammatic side elevation of an alternative form of the apparatus partly in section.

FIGURE 8 shows a side elevation of the method employed to drive the fluid pump employed in the apparatus shown on FIGURE 7, with particular reference to means for overriding the mechanical drive.

FIGURE 9 shows a side elevation of FIGURE 8.

FIGURE 10 shows a milling device which may be employed in the apparatus.

One embodiment of this invention will now be described in relation to FIGURE 1.

A pipe 10 is connected to a source of fluid under pressure; such a fluid may conveniently be air. A regulating valve 12 and a pressure gauge 14 may optionally be provided in the pipe 10 in order to control and indicate the pressure of fluid reaching the apparatus. The continuation of pipe 10 in the form of the portion 16 is transparent in order that the pointer 26 may be viewed therethrough, to indicate the position of the diaphragm 22 in a manner to be described. The vessel proper consists of two portions, 18 and 20, clamped together by any convenient means, such as the quick-release clamp 24.

Between these two halves of the vessel, an extensible and collapsible divider 22 is provided, which divider separates the fluid pressure entering the vessel 18 via pipe 10 from the paste which is contained in the vessel 20. The pointer 26 is fastened to the diaphragm 22 and moves with it to indicate its position through the transparent portion of the pipe 16.

Connected to any suitable position of the vessel 20 is a pipe 30. This communicates with a nozzle 34, which is pressed against a wheel 36 in order that the paste issuing through the hole 54 may be spread on the periphery of the wheel 36, from which it is transferred to the wheel 44 for final deposition on the cigarette paper wrapped around the tobacco rod 46. As the paste passes through the pipe 30 on its way to the hole 54, it may pass through an optional device marked 32, said device being in the form of a pump, a stirring device known in the industry as a paste milling device, or a simple valve which serves to close the hole 54 when required.

The device indicated at 32 may be driven from some portion of the cigarette making machine so that it stops and starts with that machine. Motion is transmitted from the cigarette making machine by means of shafts 39 and 39'. Sprocket 42 is keyed to shaft 39'. Sprocket chain 40 transmits power to sprocket 38 which is operatively associated with device 32 so that the whole of this mechanism stops and starts with the cigarette making machine.

The operation of the paster may be briefly described as follows:

Air or other fluid enters the pipe 10 under suitable pressure from a source of supply common to a number

of machines. The regulating valve 12 and pressure gauge 14 are not necessary for this particular mode of operation and may be omitted. The air under pressure will press upon the diaphragm 22, causing it to transmit its pressure to the paste contained in the vessel 20. This pressure will cause the paste to be driven through the pipe 30 and, in this case, through the device 32 which would consist of a simple valve which would be open when the machine is running. This permits the paste to pass through the hole 54 to be spread by the nozzle 34 on the wheel 36, from which it is scraped by the periphery of wheel 44 for final spreading on the moving cigarette paper web 46.

Under these conditions, it will be seen that a very simple mechanism is envisaged, it being necessary only to supply the air to press on the diaphragm 22 in order to feed the paste in the desired fashion. The device 32 may be manually operated or may be operated automatically by any known means, so that it is open when the machine is running and closed when the machine is stationary, so ensuring that the paste flows only when required.

The diaphragm 22 may be constructed in a variety of ways. One convenient method is to use a rubberlike material so that it may follow precisely the amount of paste contained in the container 20, but other constructions are possible; for instance, a pleated diaphragm made of a semi-flexible material would serve almost as well.

A second alternative mode of operation would consist of the mechanism described above with the exception that the regulating valve 12 and pressure gauge 14 would be added to control the pressure of air entering the apparatus, so as to permit individual control at each machine of the amount of paste fed. It will be appreciated that in the first embodiment described, the air pressure would have to be maintained at a constant figure in order that all machines may feed the correct amount of paste, but by the addition of the regulating valve 12, the main supply of air pressure may be permitted to fluctuate, and variations in paste fed to different individual machines may also be obtained by varying the air pressure by means of the regulating valve 12.

In yet another embodiment, the device 32 may be replaced by a pump. In this case, the regulating valve 12 would be unnecessary, it merely being required that the air pressure entering the pipe 10 is sufficient to cause the paste to flow through the pipe 30 up to the pump. The pump is of the positive displacement type, and is designed to contain the pressure of the paste when said pump is stationary. In this case, the pump is driven at a suitable speed to deliver the desired quantity of paste through the hole 54 to the nozzle 34 so that, the pump constitutes a metering device for measuring the quantity of paste delivered to the mechanism.

The pump also performs a secondary function which may, with certain types of paste, be extremely important. It is well known that some classes of paste used in cigarette manufacturing are thixotropic, which entails that the paste must be violently churned or agitated just prior to application to the cigarette paper web, in order that the best results may be obtained. The pump performs this churning function whilst metering the paste, a suitable pump for this purpose being the well known gear type pump which does not permit a straight through flow of fluid being pumped.

A third variation of this device substitutes for the pump 32 a device known as a milling device, the term milling in the industry being taken to indicate the violent churning or stirring necessary for use when a thixotropic paste is employed. Such devices commonly consist of a screw thread mounted in a cylinder so that the groove of the thread provides a serpentine path through which the paste must travel on its way from the container to the paste delivering hole, the said screw thread being slowly rotated in order to increase the churning effect of the paste

in traveling through this serpentine path. Such a device could be used in place of the pump 32 in order to operate on the thixotropic paste, leaving the pressure as provided by the regulating valve 12, to control the amount of paste flowing therethrough.

From this it will be seen that many variations exist around the broad principle illustrated.

One feature of this device is to permit the paste supply contained therein to be replenished at any time and to avoid wasting paste as is done at the present time when an almost empty container is removed and a full one substituted in its place. In this case, a new supply of paste is forced into the vessel 20 through the connection 28, and it will be quite obvious that this may take place at any time without stopping the machine, for the forcing of the paste 28 into the container 20 will cause the diaphragm 22 to move against the fluid pressure on its opposite side to so accommodate the new volume of paste in the vessel 20. At the same time the pressure exerted by the fluid on the other side of the diaphragm 22 will remain substantially unchanged by this movement, so permitting the continued operation of the machine without any sort of interruption whatsoever.

FIGURE 2 shows an enlarged view of the connection 28, FIGURE 1, showing one means of providing for the filling or replacement of paste in the vessel 20. This shows mechanism very similar to an ordinary grease gun fitting, it being appreciated that any non-return valve of this sort will be suitable for the apparatus. It is proposed with this device that apparatus very similar to lubrication equipment be employed, and it will be seen that the normal grease gun, which in this case will be filled with paste in place of grease, would fit over the projection 52 of this connection to hold the gun in place, permitting paste to be pumped therein by any suitable method, said paste lifting the ball valve 54a against the spring 56 to flow inwardly and so to fill the chamber 20 by any convenient amount. The indicator 26 permits the operator to see when the apparatus is suitably filled. It will be readily understood that upon removal of the fitting which is hooked around the projection 52, the internal pressure exerted on the paste will cause the ball valve 54 to seat itself and so contain said pressure, the spring 56 helping in this operation.

FIGURES 3 and 4 show one method of clamping the two vessels 18 and 20 together with the flexible diaphragm 22 between, as is required for this apparatus. In this device, the stem is connected to a handle 48 at one end and a cam shaped member 50 at the other. By turning the handle 48, the cam shaped member 50 will engage the flange provided on the vessel 18 and so clamp the vessel 18 towards the vessel 20 with the diaphragm 22 between, making a suitable joint thereby. A number of these devices will of course be disposed around the circular flange of the vessel 18 in order to contain the pressure. This is the only one of many methods which could be used for this purpose.

FIGURES 5 and 6 show the apparatus with the extensible and collapsible divider 22 in varying positions.

FIGURE 5 shows the apparatus about two-thirds filled with paste, and it will be seen that the diaphragm 22 is extended to one side to accommodate this paste. At the same time, it carries the pointer 26 with it, indicating through the transparent window in the portion 16 the amount of paste contained in the device. Referring to FIGURE 6, the diaphragm 22 is shown with the apparatus as it would be when only about one-third filled with paste. Here it will be seen that the diaphragm 22 is moved under the influence of the air pressure to the opposite side of the center line, carrying with it the pointer 26, again indicating the quantity of paste in the apparatus.

Generally speaking, the paste container is closed at all times and air is excluded therefrom, so that it will seldom need cleaning internally. However, cleaning undoubtedly will be necessary at some time or another, and for

this reason the quick release devices similar to those shown in FIGURES 3 and 4 are employed to facilitate the dismantling of the apparatus.

As stated above, item 32 of FIGURE 1 is either a pump, a milling device, or a simple valve. These three items would have one feature in common, and that is that they are designed to contain the paste pressure at all times, so that when the pump and milling device are stationary or when the valve is closed, paste will not flow through the hole 54 to the applying apparatus. Thus, when the machine is stationary, air pressure will be maintained at all times on the diaphragm 22, keeping the apparatus in readiness to start without time delay, for the paste in vessel 20 will be under pressure at all times. Immediately when the machine is started, the pump or milling device will commence to rotate, thereby feeding the paste to the applying device, or in the case of a simple valve in the position 32, the valve would be opened, permitting the same thing to take place. In this way, the apparatus is ready instantaneously, which is not the case with all known devices.

FIGURE 7 shows yet another embodiment of this invention, in which the pressure on the diaphragm 22, which is used to feed the paste from the vessel 20, is applied by means of a substantially incompressible fluid in place of the compressible fluid employed in the previous examples. Said fluid may conveniently be oil or other similar liquid, and is contained in a reservoir 58. From here it is withdrawn by means of pipe 60 by a positive displacement pump 62 to be delivered via the transparent connection 16 into the vessel 18 where it presses on the diaphragm 22 as in the case described above. Here, the pump 62 will be driven by and in timed relationship with the cigarette making machine so that it runs only when the machine is running and when paste is required for the purposes of completing the cigarette rod 46.

Oil pumped into chamber 18 will displace an equal quantity of paste from chamber 20. The quantity of paste delivered may therefore be controlled by controlling the speed of rotation of pump 62. With such an arrangement, it may be advisable to employ a valve, 32<sup>d</sup>, to close off the pipe 30, when the machine is stationary, for it will be understood that the whole of the vessels 18 and 20, are under internal pressure and some paste may be extruded through the nozzle in relieving this pressure depending upon the fit of the nozzle to the wheel and the rigidity of the containers 18 and 20, and the associated connecting lines. This would, of course, feed paste when the machine is stationary, which is undesirable, for such paste would be extruded in a mass around nozzle 34 onto stationary wheel 36, the mass being carried forwardly on wheel 36 when the machine is restarted to completely foul the transfer wheel 24.

The valve 32<sup>d</sup> may be operated manually or automatically, so that when the machine is stationary this undesirable state of affairs does not occur. This also has another advantage inasmuch as the pressure contained in the vessels 18 and 20 will be maintained so that the machine is ready for instantaneous starting when restarted after stopping. It will be apparent to one skilled in the art that such a device, no matter how well constructed, will not maintain pressure such as this indefinitely, and should the machine be allowed to rest for long periods of time, say, for thirty minutes, the pressure would gradually bleed out from the system, causing difficulties in starting which may be overcome as will now be described.

One way of making automatic valve 32<sup>d</sup> consists in connecting thereto an electrical control means 33 which is connected to the circuit of the motor driving the cigarette making machine. This control opens valve 32<sup>d</sup> when the machine is started and closes it when the machine is stopped.

As stated above, the pump 62 is a positive displacement pump which delivers oil at exactly the same rate as the paste is required to leave the vessel 20 via pipe 30. This can only occur when the whole of the vessels 18

and 20 are under an equilibrium pressure. After a period of stoppage when the internal pressure is virtually zero, it will be necessary for the pump 62 to build up this pressure before the paste commences to feed at the desired rate through the pipe 30. Under normal machine running conditions, this would take perhaps thirty seconds or even a minute, depending on the elasticity of the vessels 18 and 20, thus causing difficulties in obtaining the correct amount of paste on the cigarette rod paper 46 at starting. In order to overcome this, it is necessary to devise means for quickly increasing the pressure in the vessel 18 after stopping for extended periods and one method of doing this is to provide devices whereby the pump 62 may be manually or automatically rotated at a rate faster than normal, so that during periods of starting, the amount of oil delivered by said pump may be in excess of the amount of paste required from the apparatus to compensate for the elasticity of the containing vessels. One method of doing this is shown in FIGURES 8 and 9.

Here, the pump 62 is driven by a chain 68 from some portion, not shown, of the cigarette making machine, so that said chain moves when the machine is in operation, and is stationary when the machine is stationary. This chain cooperates with sprocket 70 and drives shaft 72, to which is fastened a disc member 74 carrying a pawl 76 which in turn drives the ratchet wheel 80 which is keyed to the shaft 78 to drive the pump 62; thus, the pump is driven in synchrony with the cigarette maker.

Attached to the ratchet wheel 80 is a second ratchet wheel 82, which also is rigidly keyed to the shaft 78 and turns at all times with the ratchet 80. When the machine is running, it will be understood that the pump 62 will be rotating at a comparatively slow speed, for the amount of paste normally required from a device of this sort is very small. This makes it possible to override the manual pump drive by means of the pawl 84 which cooperates with the ratchet wheel 82, said pawl 84 being connected to a hand lever 86, so that by merely oscillating the hand lever 86, the pawl 84 will engage with the ratchet wheel 82 to rotate said ratchet wheel, causing it to override the pawl 76 even when the machine is running. The hand lever 86 need only be oscillated for a short period less than the time necessary for the pump 62 to build up the desired pressure. Thus, the pump may be caused to deliver an excess of oil at starting by any amount according to the operator's will.

It will be appreciated that many other methods exist for overriding the pump drive. For instance, the ratchet wheel 82 and pawl 84 may be actuated by causing the lever 86 to be automatically oscillated by means of a solenoid device. Alternatively, an electric motor could drive a gear mounted on shaft 78 to over drive the pump, said motor being controlled by a centrifugal switch responsive to the main machine speed.

With this embodiment, the method of replenishing the paste in the vessel 20 will require somewhat different operation from that employed in the other embodiments, for in this case, paste is extruded from the vessel 20 by positive displacement by oil which is pumped into the vessel 18, thus rendering it impossible to pump paste into the vessel 20 unless special provisions are made.

These provisions consist of a secondary connection 64 and a relief valve 66, which valve is adjusted to contain the working pressure necessary to feed the paste under normal conditions but which will permit the outward flow of oil from the vessel 18 should the pressure therein become excessive. In this way, paste may be pumped into the vessel 20 via the connection 28 in the manner already described, the diaphragm 22 accommodating the varying amount of paste being introduced. It will be seen that the introduction of paste in this way will cause the pressure within the vessels 18 and 20 to be raised somewhat above the normal, causing the relief valve 66 to lift to permit oil from the vessel 18 to return via pipe 64 into the reservoir 58. Thus, paste may be introduced to the vessel 20 at any time without interrupting the operation

of the cigarette maker exactly as was done before, the quantity of paste in the vessel 20 being indicated by the indicator 26 through the transparent window in the portion 16.

It is well known in the art to apply paste directly onto the cigarette paper on cigarette rod 46 by means of a nozzle, connected directly to a source of supply of paste under pressure, then dispensing with the nozzle 34 and wheels 36 and 44.

The apparatus described here is entirely suited to this mode of operation.

Again, this embodiment includes an extensible and collapsible diaphragm 22 to separate the fluid under pressure from the paste being fed, said diaphragm forming a partition substantially bisecting the main pressure vessel.

It will be obvious that many other forms exist for this separator which would function equally well.

For instance the paste could be contained in a collapsible flexible bottle shaped member, completely surrounded by the pressure fluid which would force the paste out of the bottle by collapsing it, alternately the pressure fluid could be introduced into an extensible bottle shaped member, which is completely surrounded by paste which would be displaced from the main containing vessel by the expansion of the bottle by reason of the fluid under pressure introduced therein.

The variations of the invention described herein are not intended to be exhaustive but have been selected to merely illustrate the invention which may be varied within the scope of the claims to include many possible embodiments.

The invention, therefore, is not to be restricted to the precise details of the structures shown and described.

What is claimed is:

1. Apparatus for feeding paste under pressure to the paste applying nozzle of a cigarette making machine comprising a closed vessel to contain the paste, an applying nozzle connected to said closed vessel, an extensible and collapsible divider separating the closed vessel into two compartments, a supply of fluid under constant pressure connected to that compartment not containing paste, the divider transmitting the pressure to the paste to force it through the nozzle, said divider conforming to changes in the volume of paste in the compartment, a connection communicating with that compartment containing the paste, a spring loaded non-return valve in such connection to retain the paste under pressure and to permit the replenishment of paste in the paste compartment as necessary.

2. Apparatus for feeding paste to a cigarette machine paster comprising a vessel divided into two compartments by an extensible and collapsible wall, paste applying mechanism, one compartment containing paste being connected to the paste applying mechanism, the second compartment being connected to a source of fluid under pressure, at least a portion of this second compartment being transparent, an indicator moving with the extensible and collapsible wall, said indicator being extended to the transparent portion of the compartment to provide a visible indication of the position of that wall.

3. In a cigarette making machine, apparatus for feeding paste comprising a paster mechanism, a vessel divided into two compartments by an extensible and contractable wall, one compartment containing paste being connected to the paste applying mechanism, a connection for filling the paste compartment, a spring loaded check valve in said connection to permit paste to enter said compartment and to prevent paste leaving the compartment via the connection, the second compartment being connected to a source of fluid under pressure, said pressure being transmitted to the paste in the first compartment and means for automatically maintaining a constant pressure in said second compartment.

4. Apparatus for feeding paste to a cigarette machine paster comprising an extensible and contractable wall,

a compartment on one side of the wall connected to a source of fluid under constant pressure, a compartment on the opposite side of the wall containing paste, a paste applying mechanism, a connection joining the second compartment to the paste applying mechanism, a positive displacement pump through which the paste must pass on its way from the second compartment to the paste applying mechanism and a drive for said pump to cause it to deliver the desired amount of paste to the paste applying mechanism.

5. Apparatus for feeding paste to a cigarette machine paste applying mechanism, comprising a vessel to contain the paste, an extensible and contractable wall dividing the vessel into two compartments, means for applying constant fluid pressure onto the wall so as to force the paste out of the vessel to the paste applying mechanism, a positive displacement pump through which the paste must pass on its way to the applying mechanism, a drive for said pump at the necessary speed to cause it to deliver the desired quantity of paste to the applying mechanism, said drive being taken from a mechanism driven from the cigarette machine so that paste is delivered only when the cigarette machine is in motion.

6. Apparatus for feeding paste to a cigarette machine paste applying mechanism comprising a vessel to contain the paste, an extensible and contractable wall dividing the vessel into two compartments, means for applying constant fluid pressure onto the wall to force the paste out of the vessel to the paste applying mechanism, an escapement device for metering the paste through which said paste must pass on its way to the applying mechanism, a drive for the escapement device means operatively connected to the cigarette machine to ensure that the escapement device is driven only when the cigarette machine is running, said escapement being constructed to contain the paste under pressure when it is not being driven.

7. Apparatus for feeding paste to a cigarette machine paste applying mechanism, comprising a vessel to contain the paste, an extensible and contractable wall dividing the vessel into two compartments, means for applying constant fluid pressure onto the wall to force the paste out of the vessel to the paste applying mechanism, a valve through which the paste must pass on its way to the applying mechanism and means for automatically opening the valve, operatively connected to the cigarette machine, to open the valve when the cigarette machine is started and closing it when the cigarette machine is stopped.

8. Apparatus for feeding paste to a cigarette machine paste applying mechanism, comprising a vessel to contain the paste, an extensible and contractable wall dividing the vessel into two compartments, means for applying constant fluid pressure to the wall to force the paste out of the vessel to the paste applying apparatus, a milling device through which the paste must pass on its way to said paste applying apparatus, means for driving the milling device in synchrony with the cigarette maker, said milling device being constructed to contain the paste under pressure when it is stationary.

9. Apparatus for feeding paste to a cigarette making machine comprising a paste applying apparatus, a vessel divided into two compartments by an extensible and contractable wall, one compartment containing the paste to be fed, connected to the paste applying apparatus, the other compartment containing a substantially incompressible fluid, a positive displacement pump driven in synchrony with the cigarette making machine to deliver the incompressible fluid into the second compartment to displace the extensible and contractable wall to feed paste to the paste applying apparatus in direct proportion to the amount of uncompressible fluid pumped and automatic valve means for maintaining the incompressible fluid under constant pressure.

10. Apparatus for feeding paste to a cigarette making

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machine comprising a paste applying apparatus, a vessel containing paste and an incompressible fluid, an extensible and contractable wall to separate the two substances within the vessel, a connection from the paste side of the vessel to the paste applying apparatus, means to permit the replenishment of paste in the vessel whilst the apparatus continues to function, a reservoir for the incompressible fluid, a positive displacement pump driven in synchrony with the cigarette making machine to deliver incompressible fluid from the reservoir to the vessel, a connection between the fluid side of the vessel to the fluid reservoir, said connection being normally closed by means of a relief valve which is adjusted to permit the return of the incompressible fluid from the vessel to the fluid reservoir when the extensible and contractable wall is displaced during the paste replenishing operation, but which will contain sufficient pressure to feed the paste to the paste applying apparatus at all times.

11. Apparatus for feeding paste from a vessel comprising a vessel to contain the paste, a paste applying apparatus communicating with said vessel, said vessel being divided by a separating wall which will accommodate changes

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in volume of the contained paste, a supply of a substantially incompressible fluid under pressure to press on the wall which in turn presses on the paste to feed it, a pump to supply the incompressible fluid under pressure, a drive for the pump which is positive, an auxiliary drive and means to permit the auxiliary drive to override the positive drive when it is necessary to drive the pump faster than normal.

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