

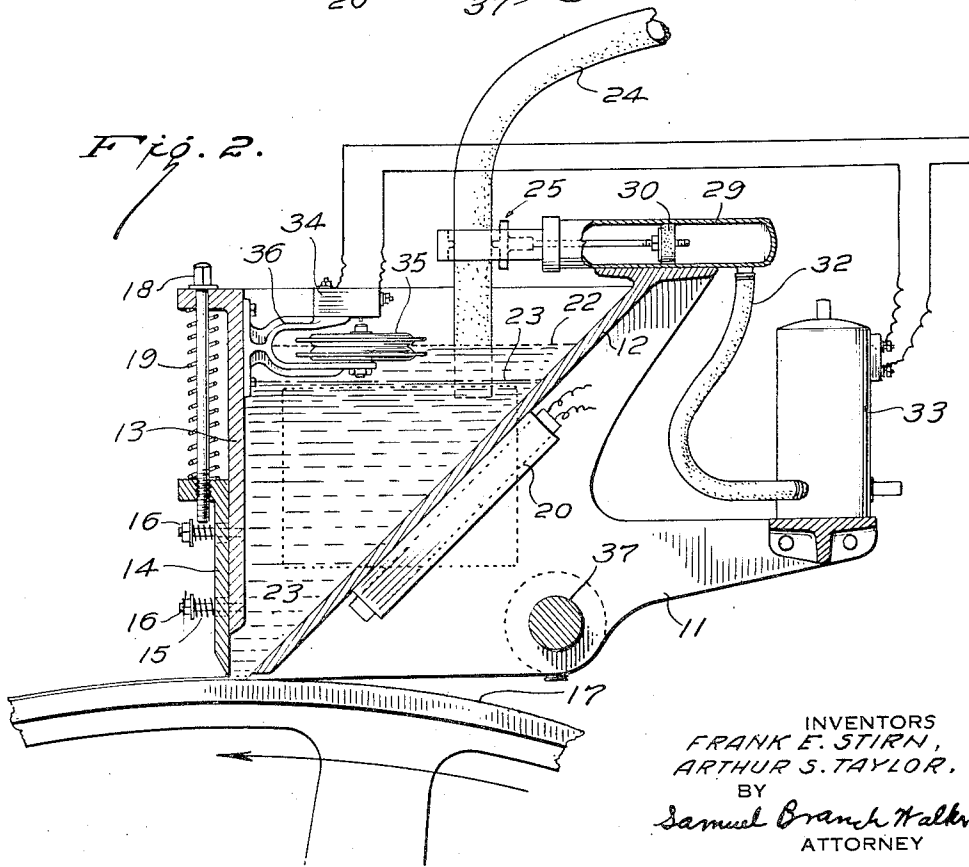
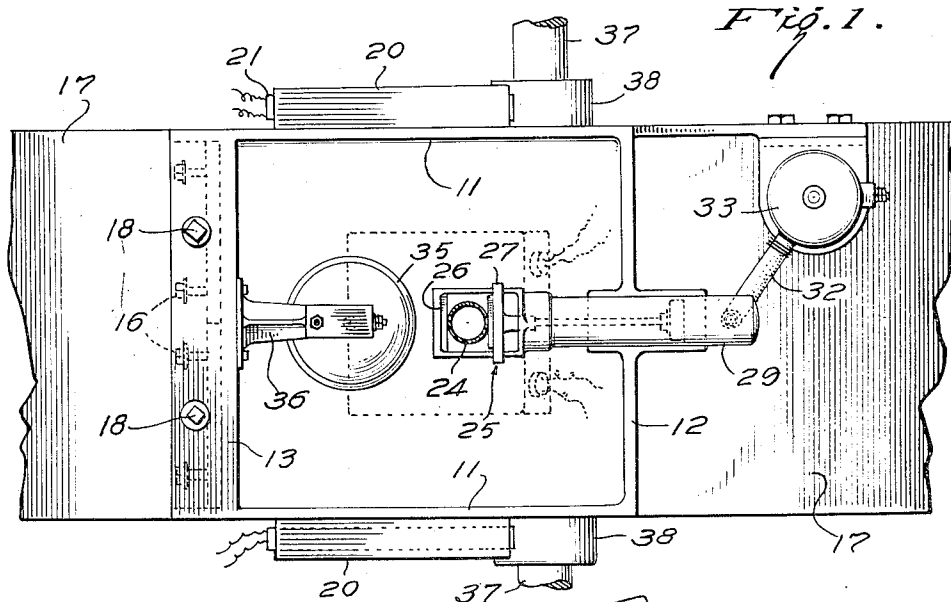
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F. E. STIRN ET AL
GELATING FILM CASTING MACHINE

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2 Sheets-Sheet 1



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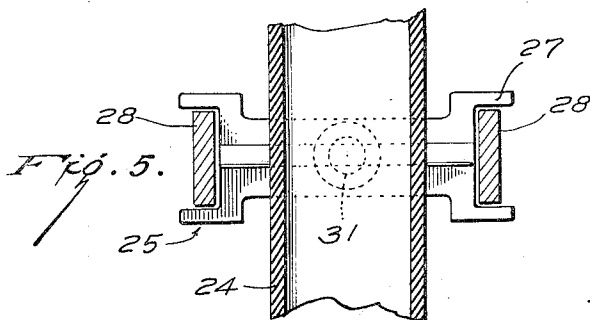
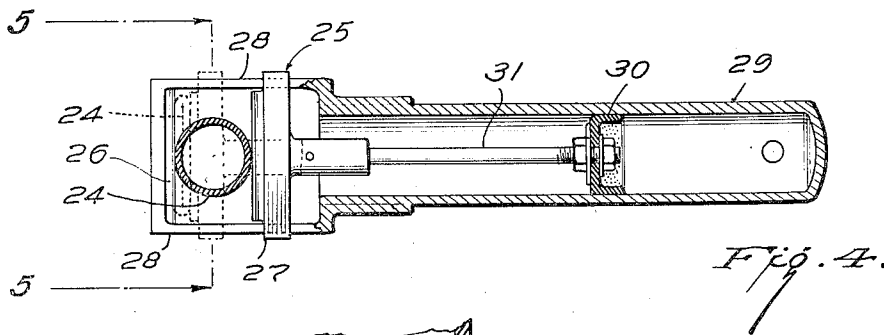
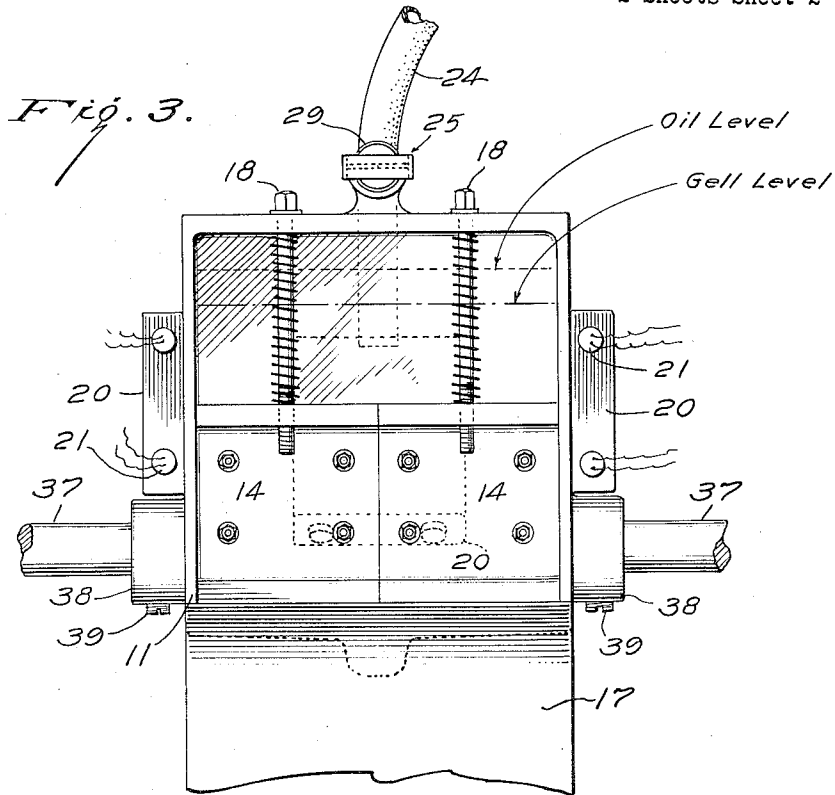
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GELATIN FILM CASTING MACHINE

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Application September 2, 1950, Serial No. 182,960

3 Claims. (Cl. 137—341)

This invention relates to an improvement in a machine and method of casting a smooth, uniform, self-supporting gelatin composition film.

It is an object of our invention to provide a means whereby a gelatin composition in a casting hopper is protected from the air.

It is an object of our invention to provide a means whereby the gelatin composition level in a hopper may be accurately and conveniently controlled.

It is an object of our invention to provide a means whereby the gelatin composition temperature in a hopper may be conveniently and accurately maintained.

It is an object of our invention to provide a level control system which is not subject to sticking, binding, or other malfunction resulting from the extremely adhesive nature of the gelatin composition being cast.

It is an object of this invention to provide a control means whereby the liquid level of the gelatin composition in the casting hopper may be adequately maintained without the gelatin composition being permitted at any time to contact the air or to be cooled or overheated, and at all times to be protected from contamination.

It is an object of this invention to provide a casting hopper whereby a smooth, continuous, uniform supply of gelatin composition may be poured forth onto a casting surface to provide a film of definite predeterminable thickness and quality.

Various other objects and advantages of our invention will be apparent from the following specification, claims and drawings wherein:

Figure 1 is a top view showing the gelatin composition hopper heat control means and gelatin composition flow control means.

Figure 2 is the side elevation in section showing the details of the gelatin composition hopper.

Figure 3 is a front view showing the hopper riding on the casting surface.

Figure 4 is the section through the pinch valve.

Figure 5 is the section along line 5—5 of Figure 4 showing further details of the pinch valve.

It is old to form gelatin composition sheets, ribbons, or films by depositing a film of a liquid gelatin composition upon a moving surface upon which it is permitted to solidify. Various aspects of such devices are shown in the patent to Kath, 2,292,760, August 11, 1942, and other similar gelatin composition film casting devices. For films for gelatin composition capsules, the mixture may conveniently consist of from 49 to 40 parts gelatin, 18 to 30 parts of glycerin and 33 to 30 parts of water, with such flavors, dyes and pigments as desired for odor, color, and taste control.

We have found that rather than using a fluid jacket for the hopper that by using a material with high heat conductivity, such as brass, copper or aluminum, and electrical resistor elements in blocks attached to a hopper constructed of these heat conducting materials, it is possible to build a much lighter and more conveniently operable gelatin composition film casting hopper.

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As shown in Figures 1 and 2, the hopper may consist of side walls 11, a rear wall 12, a front wall 13, and an adjustable doctor blade 14 positioned adjacent to the front wall and urged thereagainst by hold-down springs 15 on hold-down screws 16. The side walls 11 may be designed to ride on the casting surface 17. The doctor blade is held in adjustable relationship with the front wall by the hold-down springs 15 and may be positioned by the elevator screws 18. To prevent backlash in the threaded engagement, a coil spring 19 encircling each screw and pressing down against the doctor blade may be used. If a wide doctor means is used, several screws and springs may be used.

By such means, the doctor blade may be accurately positioned, and once positioned will maintain its relative relationship for long periods.

Adjacent at least some of the surfaces of the hopper are heater elements 20. These elements may be held against the walls of the hopper by any desired means, for example, screws. For convenience, the elements may be electrical resistance elements, although steam, hot water, or other heating means may be used if available. One of these blocks may have a control thermostat 21 integral therewith for controlling the heat supplied to the heater elements to keep the temperature constant. The control element may be separate. Any of the conventional types of controls, relays, etc. may be utilized.

Oil cover layer

In the past, in the use of gelatin composition casting hoppers, it has been found that the surface of the gelatin composition exposed to the air lost moisture by evaporation and formed a comparatively hard inflexible scum or skin, portions of which became detached and clogged the casting orifice. Portions of this skin also gum up and clog the control means, valves, and other portions of the mechanism. As a result, it has been in general necessary to shut down operations for cleaning of the hopper at comparatively frequent intervals. Additionally, even while operating, changes in the gelatin composition introduced by the evaporation of moisture from the surface would cause undesired variations in the cast film. We have found that by placing a layer of an inert liquid, such as a mineral oil 22, on the surface of the gelatin composition, evaporation from this surface is prevented. The formation of a scum or skin is prevented, and the casting operation proceeds without the difficulties caused by a non-homogeneous casting medium. The liquid also serves as a heat transfer medium which is non-adhesive and prevents the gelatin composition from touching or clogging, or delaying the heat transfer into the level control mechanisms.

Ordinary pharmaceutical mineral oil is particularly satisfactory, but any liquid which is non-miscible with the gelatin composition, lighter than the gelatin composition, non-toxic and non-volatile may be used. It is desirable that the liquid have a comparatively low viscosity, a comparatively high heat transfer coefficient and heat capacity, and is desirably a liquid which preferentially wets the walls of the hopper and the control mechanism. The mineral oil sufficiently covers the walls so that the gelatin composition will not adhere thereto and cake. The thickness of the liquid layer is not critical. Conveniently, it may be thick enough so that the liquid level control mechanism contacts only this layer and the functioning of the apparatus may be observed through the liquid. Conveniently, the layer may be thicker than the total operating change in level of the gelatin composition, so that the gelatin composition never gets to a level sufficiently high to be exposed when the level drops.

In place of the mineral oil, a vegetable oil or synthetic

liquids which are non-toxic and meet the above requirements, may be used.

Level control

The gelatin casting composition 23 may be supplied through a feed tube 24 from any suitable source from which the gelatin composition is forced by either a hydrostatic or other pressure head. If the feed duct is very long it should be jacketed with a heating means so that the temperature of the gelatin composition will not change.

As shown in the figures, the feed duct is preferably a flexible elastic tube such as a fairly heavy-walled rubber tube. Rubber substitutes may be used. As shown in Figure 2, this tube leads down through the protective oil layer into the gelatin casting composition 23. For the control of the gelatin composition flow, a pinch valve 25 is provided.

This pinch valve may consist of a stationary clamp member 26 and a moving clamp member 27, whereby the feed tube may be pinched shut by the action of the moving clamp member against the stationary clamp member. Figure 4 shows the valve in open position, and in dotted lines shows the valve closed with the elastic tube pinched so as to prevent liquid flow. As shown in Figures 4 and 5, these members may be joined by a valve frame 28 which serves as a guide for the moving clamp member. Any means may be used to operate the valve, such as a solenoid, electric motor, hydraulic motor, etc.

Shown in Figure 4 is an air cylinder 29 in which an air piston 30 travels. The piston is connected by means of an operating rod 31 to the moving clamp member 27. As shown in Figure 2, the air cylinder may be fastened to a wall of the hopper. The rear wall is shown as supporting the cylinder. A spring may be used for the piston return but if a heavy-walled rubber tube is used, such a spring is not necessary, and accordingly is not shown.

For the control of the valve, an air line 32 leads from the head end of the cylinder to a control means 33. Any air control means may be used, but particularly convenient is an electrically operated solenoid, of normal commercial construction, which is selectively energized through a level control switch 34.

Float valves in the normal types of liquid level controls do not function well with as viscous a composition as a gelatin casting composition must be. They are also subject to sticking and binding, and other forms of malfunction. To avoid this, we have found that by fastening a wafer thermostat 35 and a support clamp 36, at a suitable level, as the warm oil heats the wafer thermostat, the thermostat will expand and may be used to operate the level control switch 34. This level control switch may be an ordinary micro-switch which is operable by a small pressure operating through a small distance. The wafer thermostat consists of metallic diaphragms in which there is hermetically sealed a small quantity of a fluid which tends to vaporize and expand the wafers at a desired temperature. By selection of a proper wafer thermostat which expands at the oil temperature, which may be about 150° F., the switch will be actuated as the oil layer rises. The switch in turn actuates the solenoid 33 which controls the supply of air to the pinch valve operating cylinder 29 which in turn shuts off the supply of gelatin composition through the feed tube 24.

A bi-metallic thermostat or other form of heat sensitive means may be used instead of the wafer. Other forms of control means will suggest themselves to those skilled in the art. The wafer thermostat system as shown is particularly trouble-free, convenient and economical.

For most advantageous operation, it is desirable that the gelatin casting composition be supplied through a tube of such size and under such pressure that the valve will have to remain open approximately half the time to feed

an adequate supply of gelatin composition to the casting hopper. Because of the extremely viscous nature of the composition, it is desirable that the gelatin casting composition be supplied through the tube at such a rate that it does not tend to fill the hopper too rapidly for effective level control.

The entire hopper assembly is designed to ride on the casting surface 17 and is journaled at the rear on a support shaft 37 which is suitably supported. Collars 33 and set screws 39 position the hopper laterally. The weight of the hopper assembly is sufficient to hold it against the surface of the casting drum.

Modifications and equivalent variations will suggest themselves to those skilled in the gelatin composition casting art. Such variations are, of course, within the purview of the appended claims.

As our invention, we claim:

1. A gelatin composition casting apparatus for a gelatin composition film casting machine comprising heat conducting walls forming an open hopper, heating means for said walls, thermostat means controlling the rate of flow of heat to said heating means, an inert, non-volatile, non-toxic, gelatin composition immiscible, liquid layer exposed to the air in said hopper, the liquid of said layer being lighter than said gelatin composition, a flexible feed duct for supplying a gelatin casting composition to said hopper, a non-clogging valve means adapted to control the flow of gelatin composition through said feed duct, and a thermostat means at a desired liquid level, in part exposed to the ambient air and in part contacting said liquid layer in said hopper controlling the operation of said valve means.

2. A gelatin composition casting apparatus for a gelatin composition film casting machine comprising an open hopper, a gelatin composition protecting inert, non-volatile, non-toxic, gelatin composition immiscible, liquid layer exposed to the air in said hopper, the liquid of said layer being lighter than the liquid gelatin composition, heating means for said hopper, temperature responsive means operatively controlling said heating means to maintain the hopper and its contents at a substantially constant uniform temperature, a liquid gelatin composition feed duct of flexible material, a non-clogging air operated pinch valve for controlling the flow of the liquid gelatin composition through said flexible feed duct, and control means for the air operating said air operated pinch valve comprising a heat sensitive control in said hopper which closes said pinch valve when the gelatin composition immiscible, liquid layer is in heat transferring contact with said control and which opens said valve when said layer is out of contact with said control.

3. An open hopper for a gelatin composition film casting machine having an oil layer in said hopper, the upper surface of said oil layer being exposed to the ambient air, temperature responsive means controlling heating means to maintain the hopper and its contents at a substantially constant temperature, a flexible feed duct, a pinch valve means forming a part of said feed duct, and a thermostat at a control level in said hopper, said thermostat being in part exposed to the ambient air and in part contacting said oil layer, controlling the operation of the pinch valve.

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