Jan. 6, 1953 H. J. McDERMOTT 2,624,070

SPINNING OR EXTRUSION APPARATUS

Filed June 4, 1951

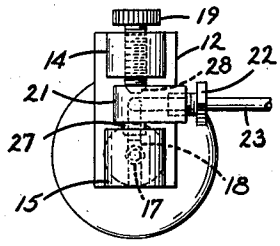

Fig. 3

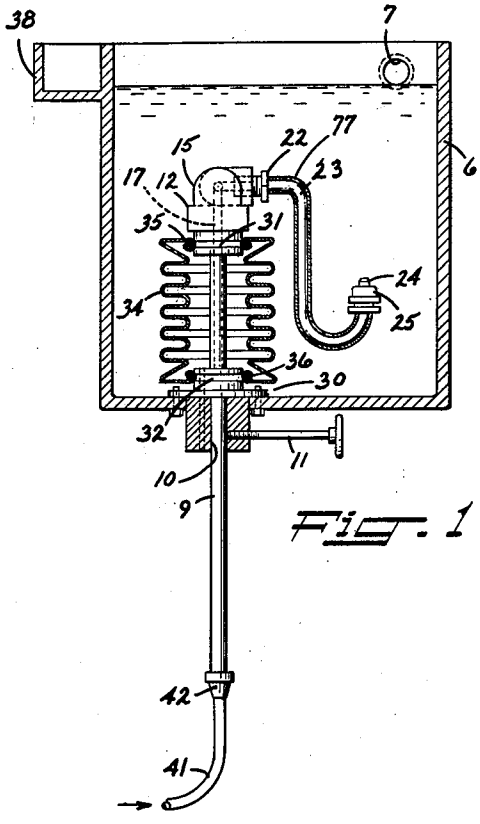

Fig. 1

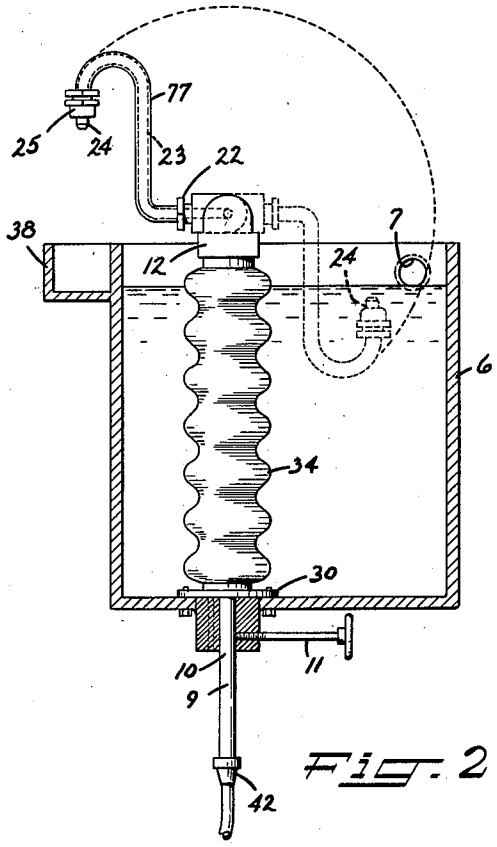

Fig. 2

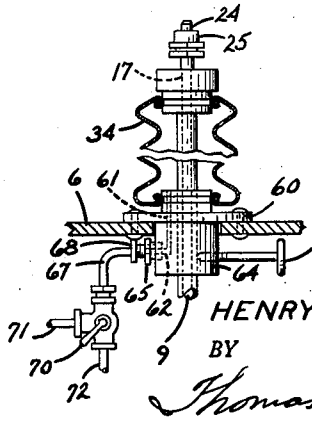

Fig. 4

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Patented Jan. 6, 1953 2,624,070

UNITED STATES PATENT OFFICE

2,624,070

SPINNING OR EXTRUSION APPARATUS

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Application June 4, 1951, Serial No. 229,821

10 Claims. (Cl. 18—8)

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This invention relates to equipment for producing artificial filaments, ribbons, films and other continuous products of small cross-section and particularly to apparatus suitable for extruding fine streams of a film-forming liquid into a liquid bath wherein the streams are converted into filaments, films, etc.

It is an object of the present invention to provide an adjustable mounting for a spinneret or extrusion plate whereby the spinneret or plate may be adjusted upwardly or downwardly within a container for a liquid spinning bath to provide a wide range of immersion depths for such plate or spinneret. It is also an object to provide a spinneret mounting which may be moved to facilitate swinging of the spinneret to a position laterally of the container whereby liquid may be discharged from the spinneret into a drain disposed exteriorly of the container. Still another object is to provide means for adjusting the position, and controlling the movement, of structure disposed generally within a spinning bath container for supporting the spinneret and supplying a film- or filament-forming material thereto. A further object is to insulate a feed tube for an extrusion plate or spinneret (and the material passing thereto) from the transfer of heat to or from a liquid bath maintained at a substantially different temperature than the material passing through the tube. Other objects, features and advantages will be apparent from the following description of the invention and the drawing relating thereto in which

Fig. 1 is an elevation partly in section of one embodiment of the invention;

Fig. 2 is an elevation partially in section of the apparatus of Fig. 1 with the movable portions thereof shown in another position;

Fig. 3 is a plan view of a swivel joint illustrated in Fig. 1; and

Fig. 4 is a fragmentary elevation partly in section of another embodiment.

In accordance with the present invention, apparatus for extruding or spinning filamentary material or other continuous products of small cross-section is provided in which an extrusion plate or spinneret is supported within a container for a coagulating liquid in which the plate or spinneret may be submerged. The apparatus comprises a vertically adjustable structure disposed generally within the container for supporting the spinneret and for feeding film-forming material thereto. The supporting and feeding structure comprises a rigid feed member surrounded by a collapsible boot or sleeve of resilient

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material with an upper portion thereof in sealed relationship with the member and a lower portion thereof in sealed relationship with the bottom of the container. The feed member extends through the bottom of the container and therebeyond a distance depending on the desired range of vertical adjustment. Optionally, the structure includes a swingable conduit for mounting the plate or spinneret to permit the swinging thereof to a position outside the container during periods of doffing.

In Figs. 1 to 3, a container 6 is provided having an overflow port 7 or other drainage means for maintaining a predetermined level of liquid within the container. A vertical tube 9 extends slidably through an aperture 10 in the bottom of the container. The tube is vertically traversable and the position thereof with respect to the bottom of the container may be fixed by suitable means such as a set screw 11. The tube 9 terminates in a cap or head 12 having bifurcate portions 14, 15 as shown more clearly in Fig. 3. The head 12 is provided with a passageway 17 extending into the bifurcate portion 15 into intersecting relationship with an inwardly extending passageway 18. A screw 19 extends through the portion 14 substantially in alignment with the axis of passageway 18. An assembly comprising a fitting 21, a coupling 22, a tube 23, an extrusion device such as the spinneret 24, and a coupling 25 for attaching the spinneret to the tube 23, is swingably supported on the head 12 with the fitting 21 held in clamped relationship between the bifurcate portions of the head. Portion 15 is recessed to receive a tubular boss 27 of the fitting 27. The fitting 21 is recessed at 28 to receive the end portion of the screw 19.

A collar 30 is provided upon the inner bottom surface of the container 6. Grooves 31 and 32 are provided on the head 12 and the collar 30, respectively, to facilitate the attachment of end portions of an accordion-like boot or sleeve 34 having annular beaded end portions which fit neatly around the head and the collar. The end portions of the boot may be secured by annular springs 35 and 36 which engage and press the ends of the boot tightly within the grooves to form a liquid-proof joint. The boot is fabricated in such a manner as to permit any desired range of vertical movement to the tube 9 and the structure supported thereon from any desired depth of spinneret such as from the position illustrated in Fig. 1 to the position illustrated in Fig. 2 wherein the tube 9 and assembly supported thereon has been elevated to such an extent that the

tube 23 and spinneret connected thereto may be pivoted to the position wherein the spinneret overhangs a receiver adapted to receive a liquid, such as a waste trough or drain 38 or other means suitable for carrying away liquid material discharged from the spinneret.

The coupling 42 mounted on the lower end of the tube 9 provides a connection with the flexible tube 41 through which a film-forming material is supplied to the spinneret 24.

Fig. 4 illustrates an embodiment of the invention wherein the lower portion of the sleeve 34 is connected in sealed relationship with the grooved periphery of a flanged collar 60. The fitting 60 is provided with a passageway 61 extending parallel to the central bore of the fitting through which the tube 9 extends in slidable relationship. A laterally extending passageway 62 communicates with the passageway 61 and a suitable fitting 65 is provided in the terminus of the passageway 62 for attachment thereto of a tube 67 by a coupling 68. Fluid may be introduced into the space enclosed by the sleeve 34 through a three-way valve 70 connected with tubes 71 and 72. In one position of the valve, a liquid or gas under pressure may be passed through tube 71 into the interior of the boot until a desired elevation of the tube 9 and spinneret is obtained. At another setting of the valve 70, the fluid contained in the sleeve 34 may be discharged into the return line 72 to storage means such as a reservoir (not shown). If desired, the fluid used may be air and the tube 72 adapted to discharge into the atmosphere. To obtain more positive control of the elevation and descent of the tube 9, a hydraulic fluid is preferably used. To secure the tube 9 at a desired position, means such as a set screw 74, may be screwed through the lower extension 64 of the fitting 60 into engagement with the tube 9.

When it is desired to pass the film-forming material from a supply source at a different temperature than that maintained in the bath contained within the vessel 6, the boot prevents the transfer of heat between the liquid passing through the tube 9 and the liquid within the vessel. The region enclosed by the sleeve is a particularly effective barrier to heat transfer when the region enclosed thereby is filled with air or gas. To minimize heat transfer through the swingable tube 23, a cover 77 of material having a low heat transfer coefficient may be placed around the tube 23 (Fig. 1). Such a cover is preferably liquid-impervious and resistant to chemical attack by materials contained within the bath. Some suitable materials are polyethylene, polystyrene, a glass fabric wrapping coated with a liquid-pervious material, fibrous materials formed from vinyl resins formed into a tube with the outer surface thereof rendered liquid-impervious by a coating on the outer surface thereof. As an alternative structure, the tube 23 may be provided with extra thick walls of any material having a low heat transfer coefficient.

Apparatus for spinning or extruding continuous products in accordance with the present invention is highly economical of space since the structure for supporting a spinneret may be housed substantially within a spinning bath chamber. The space outside of the spinning chamber consequently is not cluttered and permits freer movement of personnel and closer spacing of spinning units. As a further advantage, the spinneret or extrusion plate is easily and accurately adjusted in accordance with the desired depth of immersion and the arrangement herein described has the further advantage of permitting the passage of extrudable liquid through the duct system connected with the spinneret without substantial heat transfer between such liquid and the liquid of the spinning bath.

The present invention may be used for forming films, filaments, and the like by means of a liquid-coagulating bath from viscose, cuprammonium cellulose, cellulose esters, such as cellulose acetate, synthetic resins, such as nylon, vinyl polymers, such as polymers and copolymers of vinyl chloride, acrylonitrile, vinylidene chloride, vinyl acetate, vinyl pyridine, etc.

While preferred embodiments of the invention have been shown and described, it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. Apparatus for converting a film-forming material into films, filaments, and the like comprising a container having an aperture in the bottom wall thereof, an extrusion plate, means for supplying a film-forming material to the extrusion plate comprising duct means extending through the aperture upwardly into the container and coupling means for connecting the extrusion plate in communication with the duct means, an axially collapsible and expansible sleeve of a flexible liquid-impervious material surrounding a portion of the duct means extending above the aperture, means for connecting the upper end of said sleeve with the duct means in sealed relationship, and means for connecting the lower end of the sleeve in sealed relationship with a surface of the container surrounding the aperture.

2. Apparatus for converting a film-forming material into films, filaments, and the like comprising a container having an aperture through the bottom thereof, an extrusion plate, means for supplying a film-forming material to the extrusion plate comprising a straight tube extending vertically through the aperture into the container and means for connecting the extrusion plate in communication with the passageway of the tube, an axially collapsible and expansible sleeve of a flexible liquid-impervious material surrounding a portion of the tube extending above the aperture, means for connecting the upper portion of said sleeve with the tube in sealed relationship, and means for connecting the lower portion of the sleeve in sealed relationship with a surface of the container surrounding the aperture.

3. Apparatus for converting a film-forming material into films, filaments, and the like comprising a container having an aperture through the bottom wall thereof; an extrusion plate; means for supplying the film-forming material to the extrusion plate comprising a straight tube extending through the aperture upwardly within the container, a duct member pivotably connected with the upper end of the tube, said tube being traversable to an elevated position; means for coupling the extrusion plate to a portion of the duct member in communication with its passageway, said portion being remotely spaced from the end of the member connected with the tube; an axially collapsible and expansible sleeve of a liquid-impervious material surrounding a portion of the tube extending above the aperture; means

for connecting the upper end of the sleeve with the tube in sealed relationship; and means for connecting the lower end of the sleeve in sealed relationship with a surface of the container surrounding the aperture.

4. Apparatus for spinning artificial filaments comprising a container having an aperture in the bottom thereof, a spinneret, a straight tube extending through the aperture into the container, a second tube, a swivel joint for connecting the first-named tube and the second tube with the passageways thereof in communication, means for connecting the spinneret to the end of the second tube remote from said joint, said first tube being traversable to an elevated position wherein the second tube is swingable with respect thereto to carry the spinneret to a position which is laterally offset from the container, an axially collapsible and expansible sleeve of flexible liquid-impervious material surrounding a portion of the first-named tube extending above the aperture, means for connecting the upper end of said sleeve, with the upper end of said surrounded portion of the first-named tube in sealed relationship, means for connecting the lower end of the sleeve in sealed relationship with a surface of the container surrounding the aperture.

5. Apparatus as defined in claim 4 comprising a receiver mounted exteriorly of the container and disposed below the position occupied by the spinneret laterally of the container, said receiver adapted to receive and hold a liquid material.

6. Apparatus for converting a film-forming material into films, filaments, and the like comprising a container having an aperture through the bottom wall thereof, an extrusion plate, means for supplying the film-forming material to the extrusion plate comprising a straight tube extending through the aperture upwardly within the container and means for connecting the extrusion plate in communication with the passageway of the tube, an axially collapsible and expansible sleeve of a flexible liquid-impervious material surrounding a portion of the tube extending above the aperture, means for connecting the upper end of said sleeve with the tube in sealed relationship, means for connecting the lower end of the tube in sealed relationship with a surface of the container surrounding the aperture, guide means adjacent the aperture and having a surface for engaging the exterior surface of the tube for confining said tube to movement in an endwise direction, and means for adjustably securing the tube at any desired position relative to the container.

7. Apparatus as defined in claim 6 comprising

set screw means associated with the guide means for engaging the peripheral surface of the tube.

8. Apparatus as defined in claim 6 comprising means for adjustably moving the tube in the guide means.

9. Apparatus for converting a film-forming material into films. filaments, and the like comprising a container having an aperture in the bottom thereof, an extrusion plate, means for supplying the film-forming material to the extrusion plate comprising a straight tube extending through the aperture upwardly within the container, an axially collapsible and expansible sleeve of a flexible liquid-impervious material surrounding a portion of the tube extending above the aperture, means for connecting the upper end of said sleeve with the tube in sealed relationship, a fitting fastened in the aperture in fluid-tight relationship and having a bore therethrough complementary to the exterior surface of the tube, means for connecting the lower end of the sleeve in sealed relationship with a surface of the fitting extending inwardly of the container and surrounding the bore thereof, a passageway through said fitting terminating in the region enclosed by the sleeve, means comprising a conduit connected with the passageway for supplying a liquid to the interior of the sleeve, and valve means connected with the conduit for controlling the supply and the discharge of liquid to and from the sleeve.

10. Apparatus for converting a film-forming material into films, filaments, and the like comprising a container having an aperture through the bottom wall thereof, an extrusion plate, means for supplying the film-forming material to the extrusion plate comprising a straight tube extending through the aperture upwardly within the container and means for connecting the extrusion plate in communication with the passageway of the tube, an axially collapsible sleeve of a flexible liquid-impervious material surrounding a portion of the tube extending above the aperture, means for connecting the upper end of said sleeve with the tube in sealed relationship, means for connecting the lower end of the sleeve in sealed relationship with a surface of the container surrounding the aperture, means for forcing a fluid into the region enclosed by the sleeve and surrounding the tube, means for conducting fluid from said region, and means for selectively controlling the fluid introducing means and the fluid discharging means.

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No references cited.