

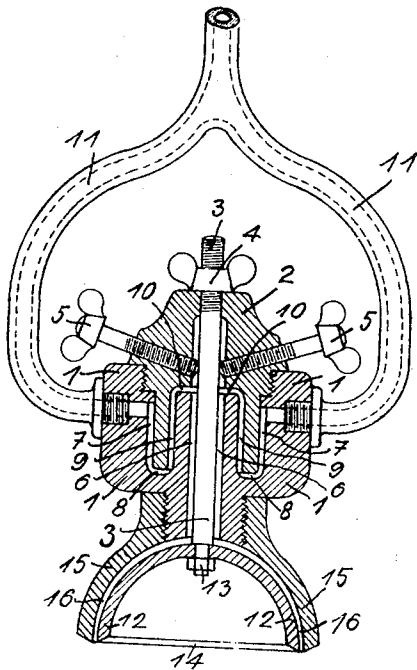
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G. J. HUCKFELDT

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DEVICE FOR EXTRUDING THIN-WALLED TUBING

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INVENTOR
G. J. Huckfeldt
by *J. A. B. Foster* ATTORNEY

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DEVICE FOR EXTRUDING THIN-WALLED TUBING

Gebhard Johannes Huckfeldt, Uetersen, Schleswig-Holstein, Germany, assignor to Huckfeldt & Thorlichen, Hamburg, Germany, a firm

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This invention relates to tubes and is particularly directed to apparatus for the manufacture of thin-walled tubular bodies, such as sausage-skins and the like, from fibrous vegetable and animal substances.

It has already been known to produce tubular bodies of this type by forcing macro-molecular masses, containing thread-like micellae, fibrillae or similar material of linear-molecular structure, through nozzles with annular channels. But it is also a fact, well known to the art, that tubes of this type, after coagulation, if necessary, and subsequent drying, possess a surprisingly small transversal strength, as compared with their much more satisfactory longitudinal strength. This lack of transversal strength is particularly noticeable if for the production material was used which was obtained through disintegration or breaking up and reduction to fragments of natural aggregations of fibres and fibrous tissues, for instance through grinding and crushing of animal-tissues, cellulose etc. in water, aqueous electrolytes or the like. When tubes of this kind are used as artificial sausage-skins the lack of transversal strength is a serious disadvantage, as it is obvious that sausage-skins when they are filled with meat are more strained transversally than in longitudinal direction, and, for that reason, will easily crack and burst open when their transversal strength is unsatisfactory.

Regarding the manufacture of artificial sausage-skins from fibrous animal and vegetable masses saturated with liquid by means of nozzles provided with shape-giving annular channels it has already been proposed to increase the transversal strength of the tubular bodies by equipping the nozzles with specially devised rotating parts, adapted to rotate the fibrous masses about the longitudinal axes of the nozzles prior to being forced out of them.

In cases where seamless tubes had been shaped from viscous substances by nozzles with annular orifices and then submerged in a precipitation bath, it had been suggested to augment the mechanical strength of the tubes by subjecting them, after leaving the nozzle and prior to their congealing, to an inside pressure of air for the purpose of stretching them.

It has further been proposed to enhance the transversal strength of tube-portions of predetermined length produced by nozzles with annular channels by placing the tube-portions immediately upon their formation in tubular moulds of larger diameter and then inflate them by air for coagulation and drying in that condition.

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But all of these methods, known to the art, need either complicated machinery or spacious arrangements, while for the last mentioned mode of production large numbers of tubular moulds are required in which the plastic portions are placed for inflation and further treatment.

In the present invention all of these disadvantages are obviated in a simple and efficient way.

According to the invention the transversal stretching of the tubular bodies takes place immediately below the annular channel of the nozzle, for which purpose the annular channel is so devised that it consists of an initial cylindrical portion of comparatively small diameter and an extension of said cylindrical portion of a larger or increasing diameter.

It has further been found that by increasing the distance between the walls of the channel of the aforesaid extension an additional transversal shifting of the fibrous constituents or units of the masses used in the manufacture and a corresponding improvement of the transversal strength of the tubes can be attained.

After the tubes have been produced in the aforesaid way they have to go through the finishing stages of the manufacture, such as coagulating, if necessary, and subsequent drying, either by way of suitable inflation with air or other stretching means, in per se known manner.

In carrying out my invention I devise the annular channel in such a way that it consists of an initial cylindrical or substantially cylindrical portion of comparatively small diameter, and an extension of a larger or increasing diameter. The cylindrical portion I make about 4 to 6 times as long as its width in order to provide a straight-lined guideway of a length sufficient to insure an adequate distribution of the pressure and a uniform formation of the tubes. The gap, forming the extension of the annular channel, may have the shape of a frustum of a cone, or may be dome-shaped or the like, and the walls of the gap may either be straight-lined, undulate, zigzag-shaped or the like. The invention further contemplates to provide means for the regulation of the width of the gap, whereby the thickness of the walls of the tubes may be adjusted and whereby, within certain limits, the degree of damming of the masses and the transversal shifting of its fibrous constituents may be supervised and controlled.

For conveying the plastic material from the supply-pipe to the narrow cylindrical portion of the annular channel in a reliable and uniform way the invention proposes the provision, be-

tween the supply-pipe and the cylindrical portion, of annular supply passages.

In the accompanying drawing, which forms a part of this application, I have illustrated, partly in section, a preferred embodiment of my invention. However, it is to be understood that the invention is not confined to any strict conformity with the drawing, but may be changed or modified so long as such changes or modifications mark no material departure from the salient features as expressed in the appending claims.

Referring now to the drawing in detail, the reference numerals 1 and 2 denote two annular bodies secured to each other by threaded engagement. Arranged in a bore of the bodies 1 and 2 is a core 3 of somewhat smaller diameter, which at its upper threaded end is secured to the body 2 by means of a nut 4, and which is maintained in adjustable position, with respect to the walls of the bore, by four adjusting screws 5 in such a way that between the lower portion of the core and the slightly wider bore in the body 1 a narrow annular channel 6 of cylindrical conformation is created. In order to distribute the plastic material, supplied by the fork-shaped supply-pipe 11 to the annular channel 6, uniformly about the core 3, the annular bodies 1 and 2 may be so devised that annular supply passages 7, 8, 9, 10 are formed. The adjusting screws 5 permit the accurate centering of core 3 in the annular channel 6, so that the production of tubes with uniform wall-thickness is reliably guaranteed.

Secured to the lower end of core 3, beneath the lower opening of the annular channel 6, is a hollow dome-shaped member 12 by means of a nut 13, while another hollow dome-shaped member 15 is secured to the lower end of the annular body 1 for cooperation with the member 12. The open end 14 of the member 12 is in vertical alignment with the axis of the core 3. The inner diameter of the member 15 slightly exceeds in size the diameter of the member 12, so that between the two dome-shaped members a gap 16 is created which forms the extension of the annular channel 6. Hence, upon leaving the annular channel 6 the tubular bodies are forced into gap 16 and expanded transversally to their longitudinal axis. Through actuation of nut 4, at the upper end of core 3, the width of gap 16 can be adjusted according to requirements.

Tests made with tubular bodies produced in accordance with the present invention have disclosed a remarkable increase in the transversal strength of such bodies.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A moulding device for continuously producing thin-walled seamless tube of plastic comprising a main body portion having a central bore and also having a tubular recess concentrically surrounding said bore, and radial inlet openings to said recess, a head portion having a projecting hollow cylindrical portion, said head portion secured to said body portion with said cylindrical portion projecting into said tubular recess and forming in combination a cross-sectional U-shaped cylindrical passageway leading with its inner extremity annularly into said central bore and forming in combination with said inlet openings an elongated supply and distribution passage for the plastic mass, a cylindrical core concentrically arranged within said central bore and having a smaller diameter than the diameter of said central bore to form an annular tubular passage of narrow gap width, said passage being

open at the end away from said head portion, a pair of dome-shaped members arranged in spaced relation one within the other, the outer of said dome-shaped members being secured to said main body portion and the inner of said dome-shaped members being secured to said cylindrical core, the space created by said spaced relation between said dome-shaped members, adjoining said open end of said tubular passage and forming an annular transversally expanding continuation thereof, and means for pressing plastic mass into said inlet openings.

2. In an extrusion device for producing a thin walled tube from a fibrous material, in combination, die means formed with an elongated cylindrical first inner surface portion merging into a second inner surface portion having a diameter increasing from the diameter of said cylindrical inner surface to a larger diameter; and core means secured to the said die means and having a cylindrical first outer surface portion located oppositely said cylindrical first inner surface portion, and merging into a second outer surface portion of increasing diameter located oppositely said second inner surface portion of increasing diameter of said second die means, said outer surface portions of said second core means and said inner surface portions of said die means being spaced from each other for a substantially constant distance for moving extruded fibers into an overlapping position inclined to the direction of extrusion so as to increase the strength of the produced tube.

3. In an extrusion device for producing a thin walled tube from a fibrous material, in combination, die means formed with an elongated cylindrical preliminary channel having a cylindrical inner surface which merges into a widening continuous inner surface portion of said die means having a diameter gradually increasing from the diameter of said cylindrical inner surface to a larger diameter; a cylindrical core member secured to said die means and extending through said cylindrical channel; and a second core member secured to said first core member and having an outer surface of gradually increasing diameter located oppositely said inner surface portion of gradually increasing diameter of said die means, the distance between said outer surface of said second core member and said widening inner surface of said die means being substantially constant for moving extruded fibers into an overlapping position inclined to the direction of extrusion so as to increase the strength of the produced tube.

4. In an extrusion device for producing a thin walled tube from a fibrous material, in combination, die means formed with an elongated cylindrical preliminary channel having an inlet and an outlet end, said die means being further formed with at least one annular feeding passage communicating at one end with said inlet end of said cylindrical passage, said die means being further formed with a widening continuous spherical inner surface portion having a diameter gradually increasing from the diameter of the surface of said cylindrical passage to a larger diameter and merging into the surface of said cylindrical inner passage at said outlet end of the same; inlet means on said die means communicating with the other end of said annular feeding passage; a cylindrical first core member secured to said die means and extending through said cylindrical channel; a second core member having spherical outer surface of gradually in-

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creasing diameter; means for adjusting said first core member in axial and radial directions; and means adjustably attaching said second core member to said first core member in a position in which said spherical outer surface thereof is located oppositely said spherical inner surface portion of gradually increasing diameter of said die means, the distance between said spherical outer surface of said second core member and said inner spherical surface portion of said die means being substantially constant for moving extruded fibers into an overlapping position inclined to the direction of extrusion so as to increase the strength of the produced tube.

5. In an extrusion device for producing a thin walled tube from a fibrous material, in combination, a main body portion having a central bore and being formed with an annular recess concentrically surrounding said bore and being further formed with at least one inlet opening in said recess; a head portion having a projecting annular wall portion, said head portion being secured to said main body portion with said annular wall portion projecting into said annular recess and defining with the same an annular passageway having a U-shaped cross section and leading with the inner extremity thereof annu-

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larly into said central bore and forming in combination with said inlet opening an elongated supply and distribution passageway for the fibrous material; and a cylindrical core concentrically arranged within said central bore and having a smaller diameter than the diameter of said central bore to form an annular tubular passage of narrow gap width, said passage being adapted to be supplied with the fibrous mass through said passageway.

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