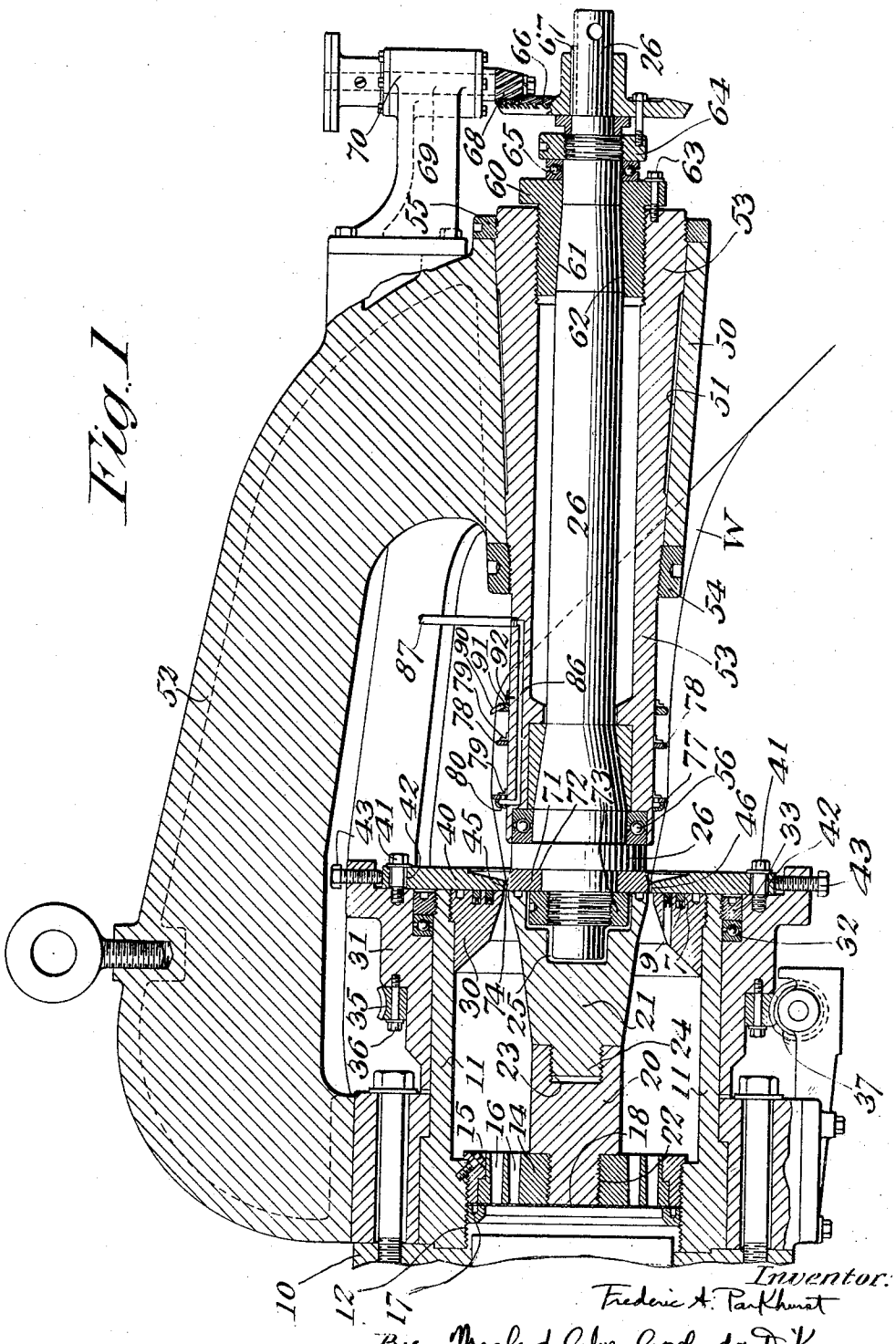
Oct. 11, 1932. F. A. PARKHURST 1,881,917

APPARATUS FOR FORMING SHEET MATERIAL

Filed Oct. 15, 1930 2 Sheets-Sheet 1

Fig. 1



Inventor:
Frederic A. Parkhurst
By Macleod, Calver, Copeland & Dike
Attorneys.

Oct. 11, 1932. F. A. PARKHURST 1,881,917

APPARATUS FOR FORMING SHEET MATERIAL

Filed Oct. 15, 1930 2 Sheets-Sheet 2

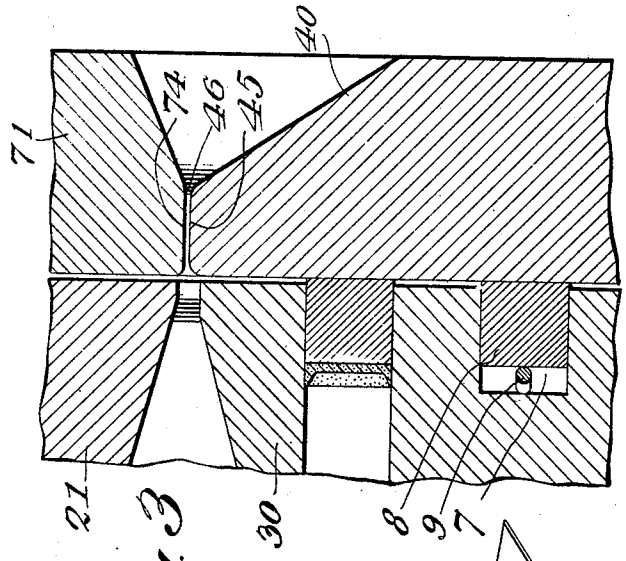


Fig. 3

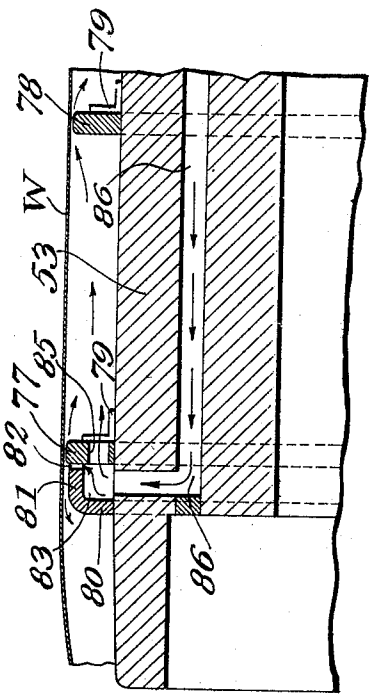


Fig. 4

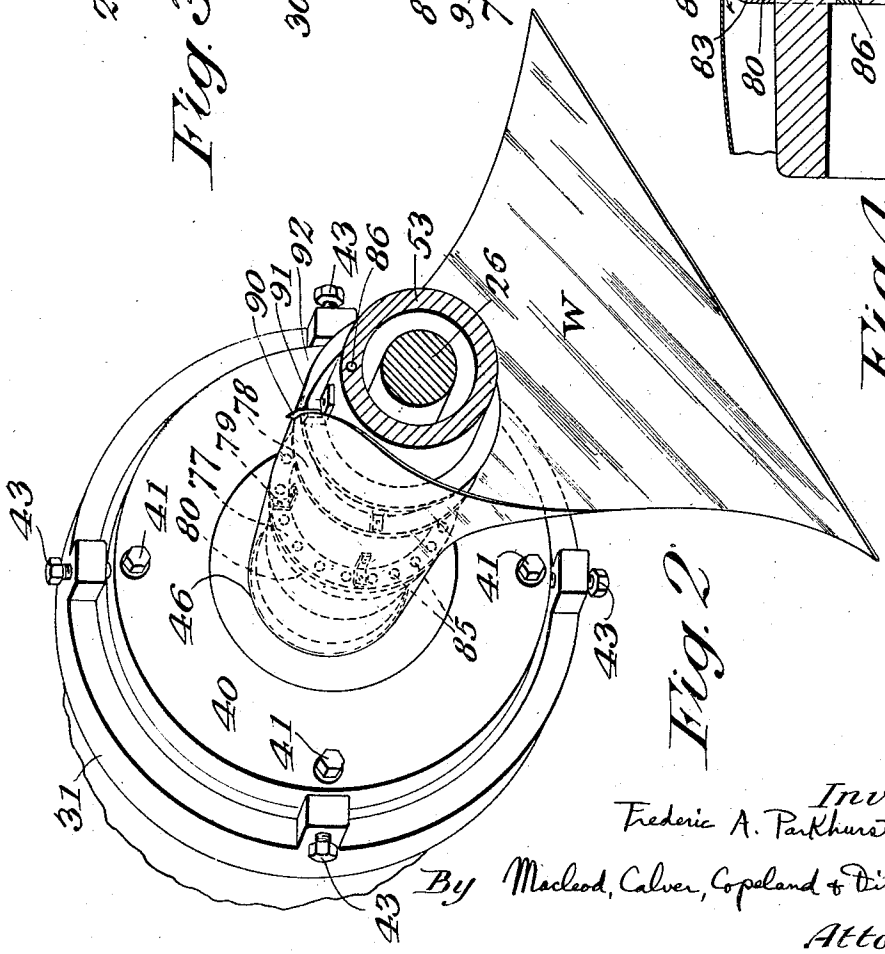


Fig. 2

Inventor:
Frederic A. Parkhurst
By Macleod, Calver, Copeland & Dike
Attorneys.

Patented Oct. 11, 1932 1,881,917

UNITED STATES PATENT OFFICE

FREDERIC A. PARKHURST, OF BETHESDA, MARYLAND, ASSIGNOR TO THE FIBERLOID CORPORATION, OF INDIAN ORCHARD, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

APPARATUS FOR FORMING SHEET MATERIAL

Application filed October 15, 1930. Serial No. 488,787.

This invention relates to apparatus for forming a web or sheet from plastic material. The apparatus of the invention is particularly adapted for forming a thin web of pyroxylin by extruding a mass of pyroxylin in plastic condition under heavy pressure through a narrow annular orifice to form a tube which is slit subsequently and opened in the form of a flat sheet. It has been found by practical experience with apparatus for this purpose that the sheet produced is subject to variations in thickness and frequently contains minute waves which may not be apparent to the eye and do not affect the value of the material for certain uses but which render it unfit for purposes where a sheet of perfect uniformity is required.

It is the object of the present invention to provide an apparatus of this type adapted to minimize the difficulties experienced with former apparatus and to produce a web or sheet of greater uniformity.

Before explaining in detail the present invention, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention beyond the terms of the several claims hereto appended as considered in view of the prior art and the requirements thereof.

The invention will be more clearly understood from the following description in conjunction with the accompanying drawings: in which,

Fig. 1 is a sectional elevational view, partly broken away, of an apparatus embodying the invention;

Fig. 2 is a perspective view of a portion of the apparatus; and

Figs. 3 and 4 are detail sectional views of portions of the apparatus.

One form of apparatus embodying the invention is illustrated in the accompanying drawings and comprises an extrusion press 10 having a hollow stationary head 11 formed as a part thereof. The interior of the hollow head 11 is provided with a threaded portion 12 adapted to receive a bridge member 14 held in place therein as by a bolt 15. The bridge member 14 is provided with a plurality of openings 16 connecting the interior of the hollow head 11 with the feed chamber of the press. An annular frame 17 is threaded upon the portion 12 and is provided with a screen 18 adapted to abut the bridge member 14. A bridge center composed of members 20 and 21 is suitably secured to the bridge 14. For this purpose, the member 20 is provided at one end with a threaded stem 22 adapted to engage the bridge member 14 and is provided at its other end with a threaded socket 23 adapted to receive a threaded stem 24 upon one end of the member 21. The other end of the bridge center member 21 is provided with a socket 25 adapted to receive the free end of a mandrel 26 referred to hereinafter.

An annular ring 31 is rotatably mounted upon the head 11 by roller bearings 32 which engage a collar 33 threaded upon the head 11. A worm wheel 35 is secured upon the ring 31, as by bolts 36, and is adapted to engage a worm 37 rotated from any suitable source of power. An annular disc 40 is detachably mounted upon the ring 31 as by bolts 41 passing through enlarged openings 42 in the disc 40 and engaging the ring 31. The position of the disc 40 may be adjusted as by adjusting screws 43 carried by the ring 31 and engaging the periphery of the disc. The outer surface of the ring 40 is narrowed towards its central opening to provide an ironing lip 45 forming the outer extremity of an annular orifice 46. An approach ring 30 is secured within the cylinder 11 adjacent the disc 40. The surface of the approach ring 30 adjacent the disc 40 is provided with one or more grooves 7 adapted to receive a suitable packing material 8 which is held outwardly in engagement with the disc 40 as by a spring member 9. Preferably, the inner surface of the approach ring 30 and the surface of the bridge center member 21 are in-

clined toward the orifice 46. It has been found that the inclination of these members with respect to the width of the ironing lip 45 should have a definite relation. In order to obtain the best results this relationship should be determined by trial for the particular work being produced.

A support 50 having a conical shaped passage 51 serving as a bearing is carried by a plurality of arms 52 extending from the press 10 and suitably secured thereto. A conical sleeve 53 is mounted in the bearing 51 and is secured therein by annular rings 54 and 55 having threaded engagement with the sleeve 53 and abutting opposite ends of the support 50. The mandrel 26 is rotatably supported near one end of the sleeve 53 as by roller bearings 56. A bushing 60 having a conical opening 61 adapted to engage a conical surface 62 upon the mandrel 26 is threaded in the passage in the sleeve 53. The bushing 60 may be held in adjusted position by a bolt 63 passing through the bushing and engaging the sleeve 53. Axial movement of the mandrel 26 is prevented by a collar 64 threaded on the mandrel and engaging an anti-friction bearing 65 abutting the outer surface of the bushing 60. A bevel gear 66 is secured upon the mandrel 26, as by a key 67, and is adapted to engage a pinion 68 carried by a shaft 69 rotatably mounted in a bracket 70 secured upon one of the arms 52. The shaft 69 may be rotated from any suitable source of power to rotate the mandrel 26.

An annular disc 71 is held against a shoulder 72 upon the mandrel 26 as by a collar 73 threaded upon the free end of the mandrel 26 which is received within the socket 25 in the outer end of the bridge center member 21. The outer surface of the disc 71 provides an ironing lip 74 forming the inner extremity of the orifice 46.

Guides 77 and 78 surround the end portion of the sleeve 53 adjacent the orifice 46 and are secured thereto in spaced relation as by brackets 79. A member 80 is suitably secured near the end of the sleeve 53 adjacent the orifice 46 and is provided with a flange 81 extending to a point adjacent the guide 77 to provide a small orifice 82 leading from a chamber 83 formed between the member 80, sleeve 53 and guide 77. One or more openings 85 are provided in the guide 77 connecting the chamber 83 with the space between the guides 77 and 78. A passage 86 is formed in the sleeve 53 to communicate with the chamber 83 and is connected to a pipe 87 for supplying fluid under pressure, such as air. A knife 90 is carried on a disc or guide 91 suitably secured to the sleeve 53 adjacent the guide 78, as by a bracket 92.

The mandrel 26 may be adjusted longitudinally to bring the ironing lip 74 opposite the ironing lip 45 by moving the sleeve 53 after the mandrel is centered properly therein by adjustment of the bushing 60. The ring 31 carrying the disc 40 is rotated from any suitable source of power through the worm 37 and worm wheel 35. The mandrel 26 is rotated in the opposite direction at a slightly slower speed from any suitable source of power through the pinion 68 and bevel gear 66. Plastic material, such as pyroxylin in plastic condition, is then forced through the openings 16 in the bridge 14 into the hollow head 11 and thence through the annular orifice 46 to extrude a thin sheet or web W in tubular form. The web W is carried over the guides 77 and 78 and at the same time air or other fluid under pressure is supplied through the pipe 87 and passage 86 to the chamber 83 and passes through the orifice 82 to engage with the web W as it approaches the guide 77. At the same time the fluid under pressure passes from the chamber 83 into the space between the guides 77 and 78 to prevent the web W from collapsing. The air or other fluid under pressure within the enclosure formed by the web W between the guides 77 and 78 escapes between the web and guides thus preventing sticking of the web thereto. After the web W passes over the guides 78 it is engaged by the knife 90 and slitted and subsequently opened in the form of a flat web which is conveyed over rolls (not shown) to a suitable drying apparatus for removing solvent from the pyroxylin web to harden the same.

I claim:

1. An extrusion die for producing sheets from plastic material comprising a head having a central opening, a mandrel projecting into said opening, a support for said mandrel outside said head, a disc mounted on said head having an opening surrounding said mandrel, and an annular disc mounted on said mandrel, said discs being spaced to provide an orifice therebetween, and means for relatively adjusting said discs.

2. An extrusion die for producing sheets from plastic material comprising a head having a central opening, a mandrel projecting into said opening, a support for said mandrel outside said head, a disc detachably mounted on said head having an opening surrounding said mandrel, and an annular disc detachably mounted on said mandrel, said discs being spaced to provide an orifice therebetween.

3. An extrusion die for producing sheets from plastic material comprising a rotatable head having a central opening, a mandrel projecting into said opening, a support for said mandrel outside said head, and a disc adjustably mounted on said head having an opening surrounding said mandrel and providing an orifice therebetween.

4. An extrusion die for producing sheets

from plastic material comprising a head having a central opening, a mandrel projecting into said opening to provide a narrow annular orifice therebetween, a support for said mandrel outside said head, said head having a hollow stationary body portion and a disc rotatably carried thereby and defining the outer wall of said orifice, an approach ring secured to said body portion abutting said disc, and packing rings between said disc and approach ring.

5. An extrusion die for producing sheets from plastic material comprising a head having a central opening, a mandrel projecting into said opening to provide a narrow annular orifice therebetween, a support for said mandrel outside said head, said head having a hollow stationary body portion and a disc rotatably carried thereby and defining the outer wall of said orifice, an approach ring secured to said body portion abutting said disc, a bridge abutting said body portion in spaced relation to said orifice, a bridge center extending from said bridge towards said mandrel, said bridge center and approach ring having adjacent surfaces inclined away from said orifice.

6. An extrusion die for producing a web from plastic material comprising a hollow head having a central opening, a stationary support outside said head, a sleeve carried by said support having its axis aligned with the axis of said central opening, a mandrel rotatably carried by said sleeve and projecting into said opening, and means for centering said mandrel in said sleeve.

7. An extrusion die for producing a web from plastic material comprising a hollow head having a central opening, a stationary support outside said head having a conical bearing, a sleeve adjustably mounted in said bearing, and a mandrel rotatably mounted in said sleeve and projecting into said central opening.

8. An extrusion die for producing a web from plastic material comprising a hollow head having a central opening, a stationary support outside said head having a conical bearing, a sleeve adjustably mounted in said bearing, a mandrel rotatably carried by said sleeve and projecting into said central opening, said mandrel having a conical bearing portion, and a bearing adjustably mounted in said sleeve and engaging said conical bearing portion.

9. An extrusion die for producing a web from plastic material comprising a hollow head having a central opening, a support outside said head, and a mandrel carried by said support and projecting into said opening.

10. An extrusion die for producing a web from plastic material comprising a hollow head having a central opening, a mandrel projecting into said opening, one of said members being rotatable, and a support outside said head for said mandrel.

In testimony whereof I affix my signature.

FREDERIC A. PARKHURST.