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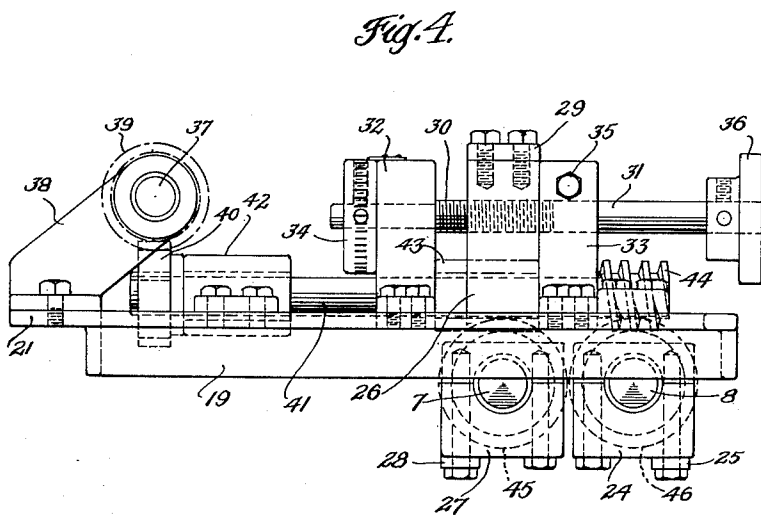
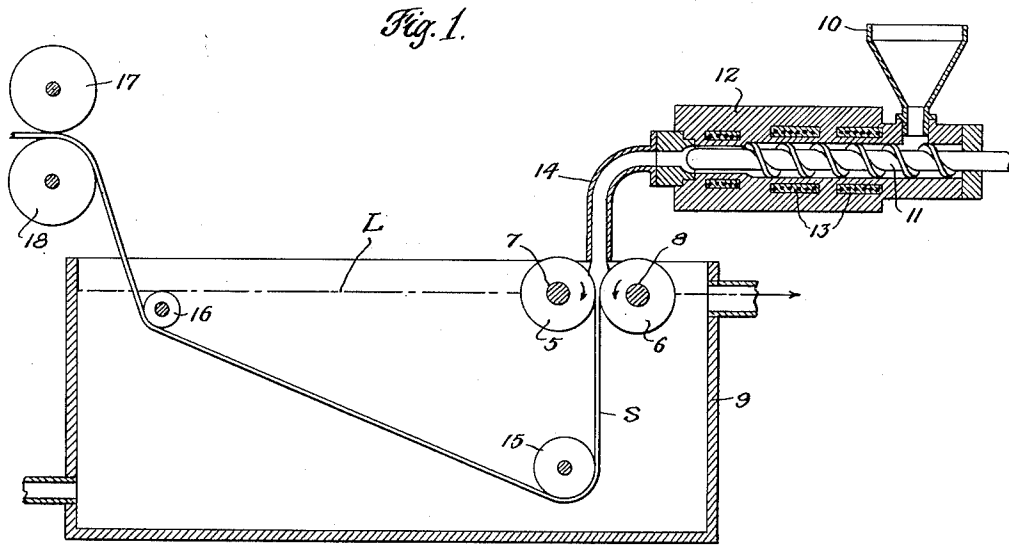
R. C. RAHM

2,627,085

APPARATUS FOR FORMING PLASTIC STRIPS

Filed July 21, 1948

2 SHEETS—SHEET 1



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Inventor  
Robert C. Rahm

Symonster & Dehmer  
Attorneys

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R. C. RAHM

2,627,085

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2 SHEETS—SHEET 2

Fig. 2.

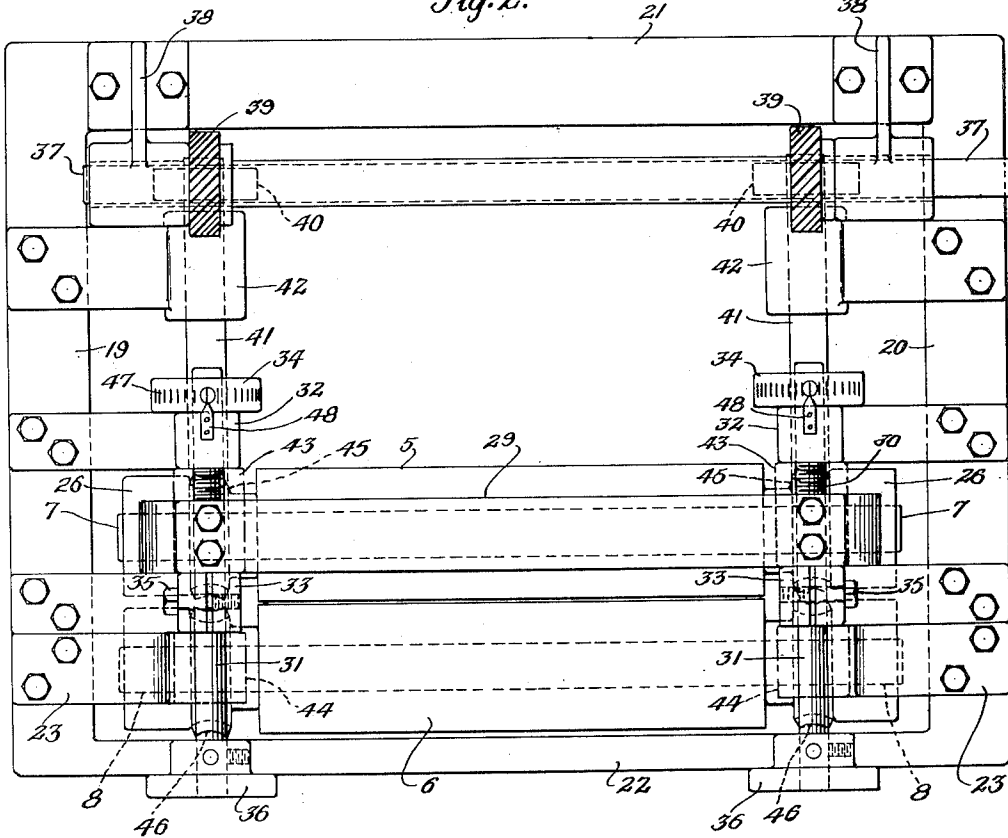
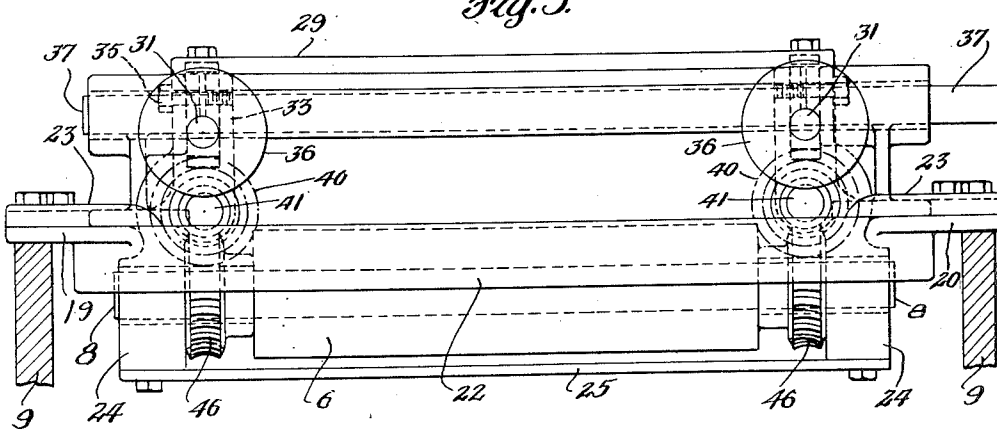


Fig. 3.



Inventor  
Robert C. Rahm

Symonstad & Lechner  
Attorneys

# UNITED STATES PATENT OFFICE

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## APPARATUS FOR FORMING PLASTIC STRIPS

Robert C. Rahm, Wyomissing, Pa., assignor to  
The Polymer Corporation, Reading, Pa., a corporation of Pennsylvania

Application July 21, 1948, Serial No. 39,954

4 Claims. (Cl. 18—9)

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This invention relates to equipment for use in the fabrication of strip stock from plastic materials, especially from the synthetic linear polyamides known to the trade as nylon. The invention is particularly concerned with the mounting and drive arrangements for a pair of forming rolls employed in equipment of the character referred to.

As disclosed in the copending application of Eugene E. Montross, Serial No. 767,282, filed August 7, 1947, issued as Patent No. 2,585,156 on February 12, 1952, equipment of this type comprises a pair of forming rolls arranged with lower portions thereof immersed in a liquid cooling bath. Molten polyamide material, for instance polyhexamethylene adipamide or polyhexamethylene sebacamide is delivered to the entrance nip of the forming rolls from a point above the liquid level in the cooling bath, and the material is concurrently rolled and solidified as it passes through the rolls into the liquid cooling bath.

It has been found that in producing strip stock by means of equipment of the general type referred to, there is a tendency to deliver a strip stock product with a wavy surface, so that the product is characterized by transverse ripples. According to the present invention, this tendency is overcome by an improved mounting and driving arrangement for the forming rolls. The mounting for the rolls according to the invention is exceptionally sturdy and the drive mechanism provides positive and accurate drive for both rolls. This is accomplished in the equipment of the invention while at the same time making provision for adjustment of the rolls toward and away from each other, whereby to provide for adjustment of the thickness of the strip stock being formed.

The equipment of the present invention also provides a particularly desirable arrangement of driving and adjusting parts located exteriorly of the cooling bath in which the rolls are partially submerged, whereby to simplify problems of lubrication and the like.

How the foregoing and other objects and advantages are attained will appear more fully from the following description referring to the accompanying drawings, in which—

Figure 1 is a somewhat diagrammatic vertical sectional view through portions of strip forming equipment of the type to which the invention is particularly applicable;

Figure 2 is a top plan view of the roll mounting, driving and adjusting mechanism of the present invention; and

Figures 3 and 4 are elevational views of the equipment shown in Figure 2, taken respectively

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from the bottom and from the left hand side of Figure 2.

Referring first to Figure 1, a pair of forming rolls 5—6 having mounting shafts 7 and 8 are mounted so as to be partially submerged below the liquid level L of a liquid cooling bath, for instance a water bath, contained within the vessel 9. Polyamide material in flake or granular form is introduced into the hopper 10 of the feeder mechanism which comprises a feed screw 11 arranged within a casing 12 having inset electrical heater elements 13. The heater elements raise the temperature of the material to the molten state and the molten polyamide is discharged through the nozzle 14 into the entrance nip of the rolls 5 and 6. As the material passes between the rolls it is chilled and solidified and formed into the strip indicated at S which passes downwardly in the cooling bath around a guide 15 and from there over guide 16, out of the bath to the rolls 17—18. Rolls 17 and 18 serve to maintain some tension on the strip S as it is drawn from forming rolls 5—6. The frictional characteristics and pressure of engagement of the rolls 17 and 18, however, is such as to permit slippage.

As seen in Figures 2, 3 and 4, the roll mounting comprises a mounting frame having side frame members 19—20 and 21—22 arranged as spaced parallel pairs and interconnected at their ends to form a centrally open square. As seen in Figure 3, the members 19—20 are provided with laterally projecting flanges serving as supporting elements which are adapted to rest upon the upper edges of the vessel 9 for the liquid cooling bath.

Roll 6 is carried on the frame by means of a pair of brackets 23—23 which are secured to the frame members 19 and 20 and extend inwardly therefrom and thence downwardly to constitute bearing blocks for the shaft 8 of this roll. Cooperating bearing caps 24—24 complete the journals for the opposite ends of the shaft 8. A tie bar 25 is extended between the caps 24—24.

The shaft 7 for roll 5 is carried by movable mounting members 26 having bearing blocks at their lower ends with which the bearing caps 27 cooperate. A transverse tie bar 28 interconnects the two bearing caps 27. The members 26 are also interconnected at their upper ends by a tie member 29, and the assembly of the various mounting parts for the roll 5 is suspended from the threaded portions 30 of a pair of adjusting screws 31, one located at each side of the machine. The mounting members 26 have threaded apertures cooperating with the threaded portions 30 of the screws 31. Each of the adjusting screws 31 is supported by a pair of

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standards 32 and 33 which are mounted on the side frame members 19 (at one side) and 20 (at the other side). To prevent axial movement of each adjusting screw 31 the screw is shouldered adjacent the standard 32 and is provided with an abutment 34 fixed thereto at the opposite side of the standard 32. Standard 33 is of split construction and is provided with a tightening screw 35 by means of which any adjusted setting of the screw may be retained. Each adjusting screw is provided with a knurled operating knob 36. By means of this supporting and adjusting mechanism for the roll 5, roll 5 may be moved toward and away from roll 6, to thereby regulate the thickness of the strip stock being formed.

The drive mechanism for the rolls includes a drive shaft 37 extended across the mounting frame and journaled in bearings supported by brackets 38—38. This shaft is carried at an elevation substantially above the mounting frame so that one end of the shaft 37 (the right hand end when viewed as in Figures 2 and 3) may readily be extended above and beyond the upper edge of the vessel 9 for the liquid cooling bath. This end of the shaft 37 is thus adapted to receive power from any suitable motor, preferably incorporating a variable speed drive. The shaft 37 carries a pair of helical gears 39—39 meshing with complementary gears 40 which are fixed on the two drive shafts 41, one of which is arranged at each side of the machine. Each of shafts 41 is mounted by means of a bearing 42 toward one end thereof which is carried by one of the side frame members. Toward the other end each of shafts 42 is journaled in a lower portion of the standard 33. Each shaft 41 further carries two worms 43 and 44 positioned to mesh with complementary worm wheels 45 and 46 which are fixed respectively on the roll shafts 7 and 8.

It will be noted that the worms 43 lie between the standards 32 and 33 and are of sufficient dimension axially of shafts 41 so as to retain proper driving interengagement with the worm wheels 45 regardless of adjustment of the movable mounts for the roll 5 to bring this roll toward and away from roll 6.

From the foregoing it will be noted that the supporting framing for the rolls comprises supporting elements or side frame members which are spaced from each other and arranged to straddle the liquid cooling bath. It will be seen, moreover, that the rolls themselves are suspended or slung from the frame and other mounting parts so as to provide for operation of the rolls partly below the level of the liquid in the cooling bath. All of the driving parts, however, except for the worm wheels 45 and 46 are mounted on the framing at an elevation above the cooling liquid.

The arrangement of the roll mounting, roll driving and roll adjusting mechanisms is further of advantage since these mechanisms are all carried on a unitary framing, so that the entire operating mechanism comprises a unit which in itself provides sturdy support and accurate drive for the rolls, entirely independently of the walls of the vessel for the cooling bath.

The employment of the particular worm and worm wheel drive for the rolls is of especial advantage in ensuring positive and accurate drive of the rolls, notwithstanding the provision for adjustment of the rolls toward and away from each other.

The adjustment mechanism is also of sturdy

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construction and is capable of highly accurate regulation of the thickness of strip stock to be formed. For the purpose of giving a visual indication of the spacing of the rolls, the abutment members 34 which are fixed to the inner ends of the adjustment screws 31 are provided with scale or graduation marks 47 which cooperate with fixed pointers 48, thereby providing a direct reading of the roll spacing. The arrangement of the invention provides for the production of strip stock of highly uniform dimensions, especially as to thickness, and this high degree of uniformity is retained notwithstanding adjustment to vary the thickness of the strip stock.

I claim:

1. Equipment for use in forming strip stock from plastic materials comprising, in combination with a liquid-containing vessel into which the formed strip stock is to be delivered, a supporting framing having spaced frame elements adapted to be positioned at the upper edges of said vessel, a pair of forming rolls slung downwardly from said framing, worm wheels fixed to rotate with said rolls, a driving shaft for the rolls extended perpendicularly to the axes of the rolls and their worm wheels, the driving shaft being mounted above the framing, and worms fixed on the driving shaft and meshing with the worm wheels at the tops of the latter.

2. Equipment according to claim 1 and further including movable mounting devices for one of the rolls providing for movement thereof toward and away from the other roll, and an adjustable support for said mounting devices located above the framing.

3. Equipment for use in forming strip stock and adapted for use with a liquid-containing vessel, said equipment comprising a supporting framing adapted to be removably mounted at the upper edge of the vessel, a pair of roll mountings for a pair of rolls suspended from and projecting downwardly from the framing, a pair of rolls carried by said mountings, the mountings for one of said rolls being shiftably movable toward and away from the mountings for the other roll and projecting above the framing, and mechanism for shifting said movable roll mountings comprising screw thread devices cooperating with the upward projections of the movable roll mountings above the framing.

4. Equipment according to claim 3 in which the movable roll mountings are suspended from the screw thread devices, and further including bracing members extended axially of the movable roll between the movable mountings therefor.

ROBERT C. RAHM.

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