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W. RODENACKER

MELTING APPARATUS

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2 Sheets-Sheet 1

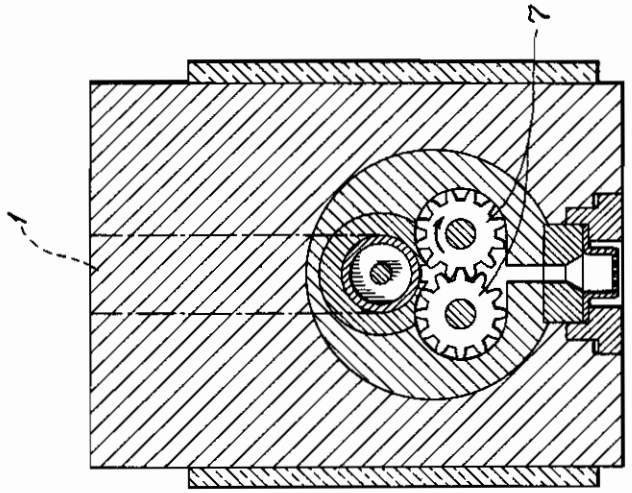

Fig. 2

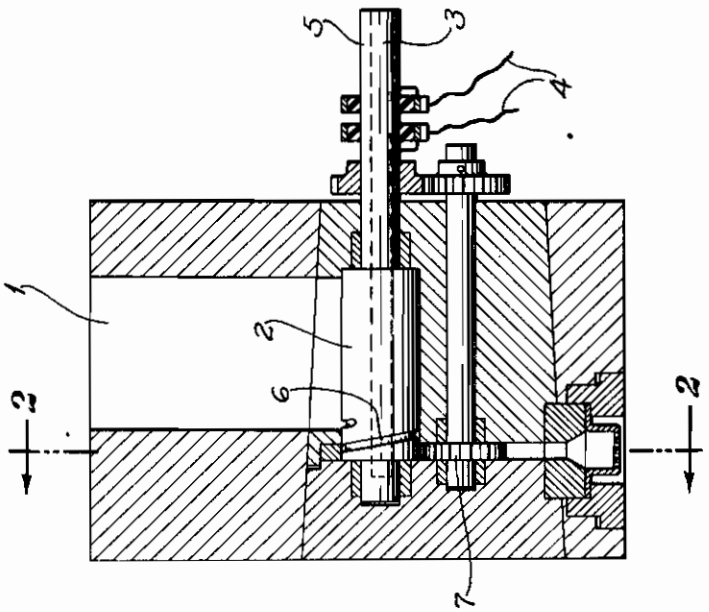

Fig. 1

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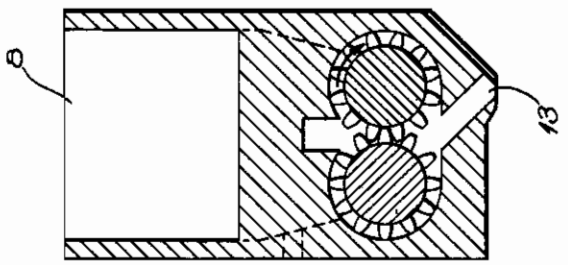

Fig. 4

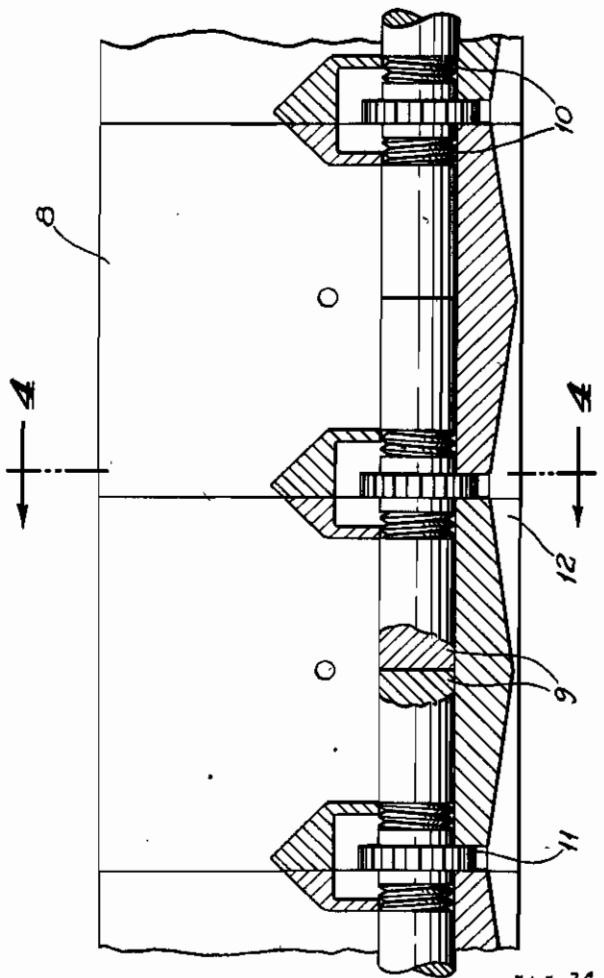

Fig. 3

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ALIEN PROPERTY CUSTODIAN

MELTING APPARATUS

Wolf Rodenacker, Berlin-Zehlendorf, Germany;
vested in the Alien Property Custodian

Application filed May 3, 1941

My present invention relates to improvements in method and apparatus for melting the ends of rods of organic compositions thermoplastic and fusible at a high temperature. More particularly, it relates to an improved method for producing foils, films, and the like from fusible high molecular weight linear polymers.

Organic materials thermoplastic and fusible at a high temperature can be worked up at a great speed into films, ribbons, and filaments or by injection molding. The employment of great speeds is, however, limited by the melting velocity of the organic composition. Owing to the low thermal conductivity of most of the compositions the heat-conducting surfaces must be rendered very large. It is therefore necessary to use large melting vessels which need heat in a great extent as they are to be kept at high temperatures. A further disadvantage of the large melting vessels resides in the fact that large amounts of molten material are continuously obtained therein. A large quantity of composition must, therefore, be maintained in the molten condition in which case difficulties are encountered respecting the sensitivity to heat of most of the fusible organic compositions.

It is an object of my present invention to provide an improved method for melting the ends of rods of organic compositions of the kind mentioned above by which a considerable reduction of the melting apparatus and of the amount of heat is reached. Further objects will become apparent from the reading of the following description.

The objects of the invention are accomplished by using a moved heating body adapted to melt the end of rods of an organic material and connected with a device for feeding the material to be melted and, if required, a mechanism for feeding the molten composition.

In order to more clearly define this invention, reference is made to the accompanying drawings in which:

Figure 1 is a front elevation of the melting device constructed in accordance with and embodying a preferred form of my invention,

Figure 2 is a side elevational view of the device shown in Figure 1,

Figure 3 is a front elevational view of a melting device suitable for the production of films, and

Figure 4 is a side elevation of the device shown in Figure 3.

Referring to the drawings, numeral 1 designates a conduit through which the organic composition in any form is introduced. At the end of the conduit 1 the composition is continuously forced, for instance, by a weight laid on it, against a drum 2 toothed like a milling cutter. Said drum is kept at the melting temperature by an electric heating element 3 obtaining the current by means of sliprings 4. The exact adjustment of the temperature is, for instance, effected by heat transfer to a pump body which is maintained at a constant temperature by a control mechanism. The rotatable drum 2 is driven by a shaft 5 and thus removes the just melted end of the rod whereupon the rod is forced against another hot surface. The drum can be toothed in such a manner that when the solid rod contacts it, the pre-heated composition is simultaneously cut into chips. The molten mass is transferred with a part 6 of the drum 2 to a pump 7 shown as a gear pump, part 6 being a worm. The thread of the worm is so constructed that a pressure which effects a complete filling of the toothed wheels is produced for the pump. The pitch is, for example, made progressive for this purpose. To this pressure a further pressure may be added. An inert gas, for instance, which is necessary to exclude the air from the melting chamber is pressed into the storing vessel. It is, however, also possible to employ a melting device with open filling funnel if, for instance, carbon dioxide is used for driving out the air, the pump 7 serves automatically to control the feed of the spinning mass; for if a greater portion of the composition is melted than that removed by the pump, the level of the melt rises and the heat transfer is solely effected by conduction of heat from the walls of the conduit 1. The rising of the level of melt therefore effects a lowering of the output. The pump accordingly regulates the charge as well as the discharge automatically.

The method of the invention can also be carried out in a form other than that shown in Figures 1 and 2. A melting device as described above may be used in spinning processes for producing filaments or ribbons, in casting to form films and thick plates and in injection molding. The melting device is constructed dependent upon the amount and form of the composition and the size of the single apparatus which must correspond to the machines for further treating the molten product. The material to be worked up may be employed in any form, for instance, as endless rods or ribbons, strips, cubes, or in granulated or powdered form. As device for feeding the product in the conduit to the melting drums racks are positioned which are provided

with saw teeth and adapted to move back and forth. Racks are especially suitable for feeding products in pieces. The feeding means may also comprise lateral belt conveyers. For granulated or powdered materials worms are preferably suitable. The melting drums must depend in number and size upon the desired power. It is also evident that the toothing of the elements and the condition of their surfaces must correspond to the form of the materials to be treated.

In Figures 3 and 4 a device is shown which is suitable for producing articles having large areas as, for instance, films. The material which is introduced into the vessel 8 falls on the melting drums 9 working in both directions. The drums are connected with the feeding worms 10 constructed as helical pumps engaging into one another. The worm or helical pump produces a pressure by which the toothed wheels 11 mounted together with the worms and milling cutters on the same shaft are filled. The gear pump feeds the melt into a distributing conduit 12 from which it is forced into a casting tube 13. A corresponding melting device can be constructed for a spinning apparatus having a great number of spinnerets.

The advantage of the device according to the invention resides in the fact that a part which is to be maintained at a high temperature is especially small whereby the amount of heat necessary for melting the composition can be considerably decreased. This is in particular of importance when temperatures of above 200° C must be kept which are obtained in most cases by electrically heating. A further great advantage is the regulated melting procedure in which the controlling member simultaneously effects the conveyance of the material.

The melting device of this invention is especially suitable for producing foils, films, and the like from fusible linear high molecular weight polymers such as polyamides and polyurethanes.

WOLF RODENACKER.