Dec. 19, 1939. P. DUNSHEATH 2,183,959

METAL EXTRUSION MACHINE

Filed June 14, 1938

Fig. 1.

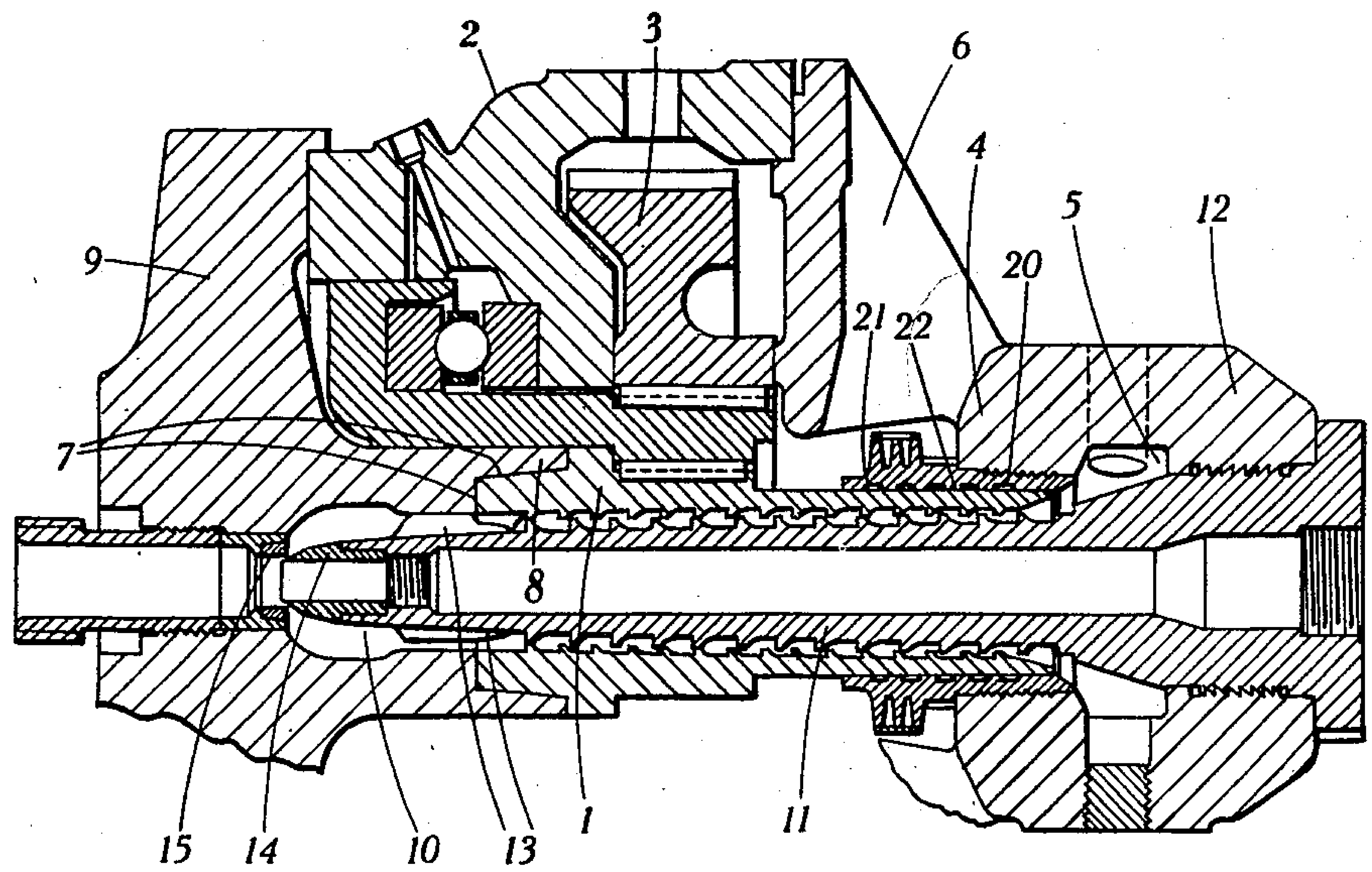
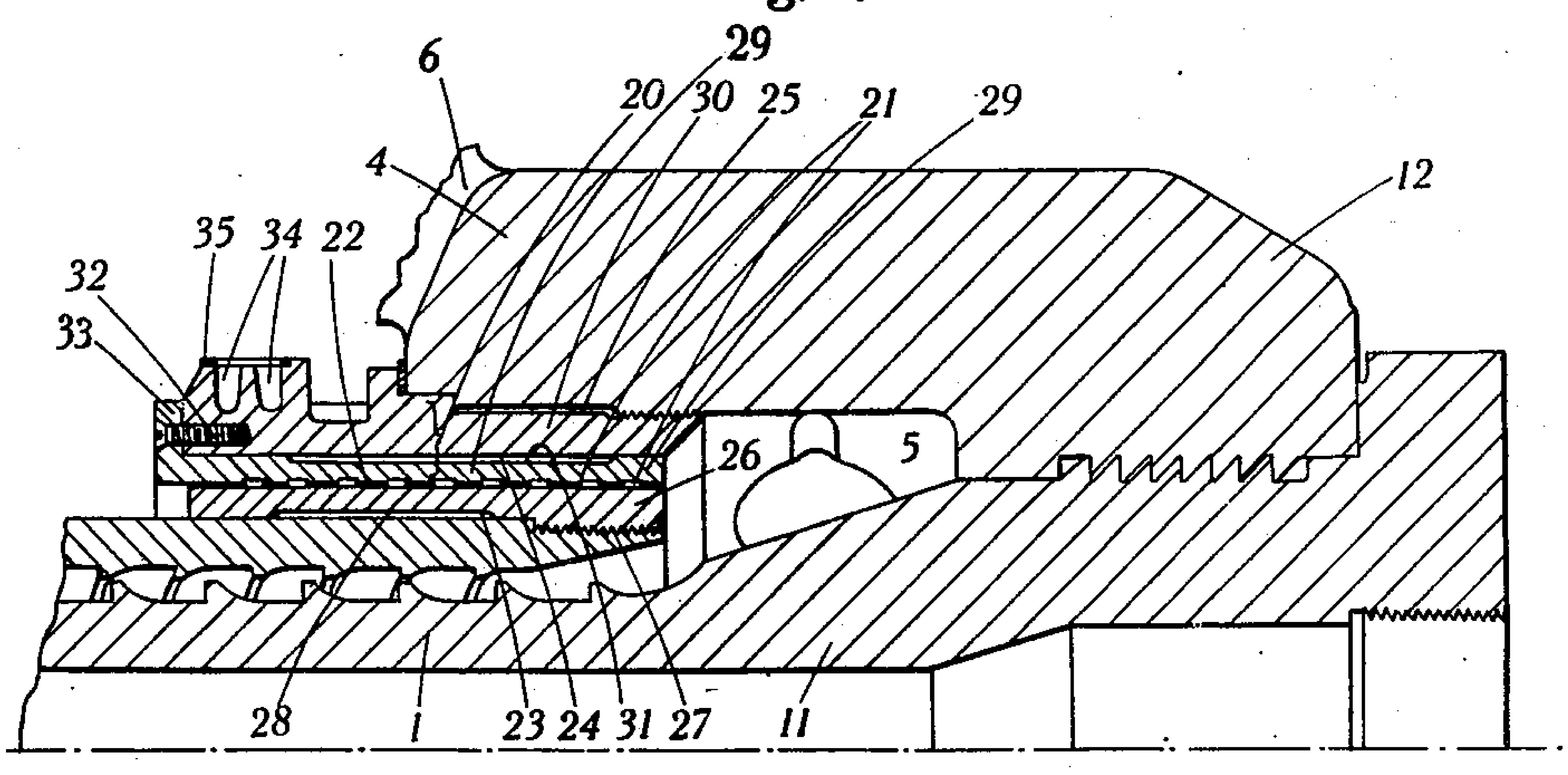


Fig. 2.



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METAL EXTRUSION MACHINE

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10 Claims. (Cl. 207—2)

This invention relates to metal extrusion machines of the kind in which plastic metal is driven into an extrusion chamber and thence through an extrusion orifice, by a rotating screw thread impelling device comprising two longitudinally extending concentric members the outer of which is driven in continuous rotation.

The invention will be described with the aid of the accompanying drawing in which,

Figure 1 shows diagrammatically in longitudinal section an example of a metal extrusion machine with a screw thread impelling device; and

Figure 2 is a fragmental cross-section on an enlarged scale showing how the construction of the rear end of the machine of Figure 1 may be modified in accordance with the invention.

In the machine shown in Figure 1 the outer part of the screw thread impelling device is constituted by a rotatable tubular member 1 provided with a screw thread on its internal surface. This member is supported in bearings in the frame 2 and driven by the wheel 3. At the inlet end it enters the stationary wall 4 of the feed chamber 5 formed in the back cover member 6 and at its front or delivery end it makes a running joint 7 with the stationary wall 8 of the socket on the front cover 9 in which the extrusion chamber 10 is formed. The inner concentric member 11 is stationary and provided with a screw thread of opposite hand to that on the member 1. At its rear end the member 11 is fixed to the rear wall 12 of the feed chamber and supported at its front end by pads 13. When the machine is to be used for the production of tubing, the inner member 11 carries at its front end an inner die or point 14 which co-operates with an outer die 15 in the front wall of the extrusion chamber to form an annular extrusion orifice. Generally in such machines a bush 20 is fitted in the wall of the feed chamber and the end of the outer part 1 of the impelling device is made a running fit in the bush, the internal surface of which is furnished with shallow grooves 21 of helical or annular form to constitute a sealing gland 22 to prevent the escape between the relatively rotating surfaces of molten metal from the feed chamber. The bush generally extends forwards beyond the wall of the feed chamber to provide for a sealing gland of adequate length.

In metal extrusion machines of the type described, molten metal is fed continuously into the feed chamber from whence it flows into the space between the concentric members forming the impelling device and it is essential to cool the molten metal in the rear part of the impelling device so that it acquires sufficient rigidity to co-operate mechanically with the surfaces of the two concentric members and be driven forward by them into the extrusion chamber and out through the extrusion orifice. This conversion of the metal from the molten to the plastic state is usually effected by applying a cooling medium, for instance, water, to the exposed outer surface of the rear part of the rotating outer member. In some cases it has been found to be difficult to cool the rear part of this rotating member sufficiently because it is in such extensive and intimate contact, through the gland, with the hot wall of the chamber containing the molten metal. It is an object of this invention to provide an improved form of arrangement for the rear end of the outer concentric member of the impelling device which avoids the aforesaid difficulty.

In the improved construction we reduce the transmission of heat from the wall of the feed chamber through the sealing gland to the rotating outer member of the impelling device by interposing in the transmission path, on either side or on both sides of the gland, one or more thermal barriers. Each barrier may be an air space or a space packed with heat insulating material, for instance, asbestos.

Referring now to Figure 2 of the drawing it will be seen that in the path by which heat may be transmitted from the hot wall 4 of the feed chamber 5, through the sealing gland 22 to the rear end of the outer impelling member 1, there are three distinct thermal barriers 23, 24 and 25. These barriers are of tubular form and concentric with one another and the sealing gland 22. The barrier 23 is provided on the inside of the sealing gland. To this end a sleeve 26 is fitted on the rear end of the rotating outer member 1 and secured thereto by a screw thread 27. The outer circumferential surface of this sleeve forms one surface of the sealing gland and co-operates with the grooved internal surface of the gland bush 20. At each end the internal diameter of the sleeve 26 corresponds to the external diameter of the rotating outer member 1 but the middle part of the sleeve is made of greater diameter to form a recess 28. The walls of this recess co-operate with the adjacent outer surface of the member 1 to form a closed pocket in the form of a thin tube. This tubular pocket is filled with air or other heat insulating material and forms the innermost heat barrier 23.

The heat barrier 24 is provided in the gland bush 20 which is made in two concentric parts

29 and 30. At each end the two parts fit closely together but between these end portions the outer circumferential surface of the inner part is provided with a long shallow recess 31. This provides a closed, thin tubular pocket between the two parts which are secured together by screws 32 passing through the flange 33 of the inner part and entering the wall of the outer part. Naturally the inner surface of the outer part 30 may be recessed instead of or in addition to the outer surface of the inner part. The pocket is filled with air or other heat insulating material to form the heat barrier 24.

The outermost heat barrier 25 is formed between the sealing gland bush 20 and the wall 4 of the feed chamber in a similar way, namely, by forming a closed pocket between these members by recessing the central part of one or both of their adjacent surfaces and filling the pocket with air or other heat insulating material.

The insertion of a thermal barrier on the feed chamber wall side of the sealing surface has the advantage that in addition to reducing the transmission of heat from the feed chamber wall through the gland to the rotating outer member of the impelling device it also reduces the transmission of heat from the chamber wall to the gland and thus facilitates the cooling of the material in the gland and ensures that it does not escape through the gland as a liquid. The provision of a thermal barrier, such as the barrier 23 in Figure 2, on the radially inner side of the sealing gland in addition to one or more barriers on the outer side, not only serves to reduce the transmission of heat through the seal to the interior of the impelling device still further but also results in the gland being thermally insulated on both sides thereof so that it is possible for it to be maintained at a temperature below that of the rotating outer member by applying a cooling medium to the gland bush. For this purpose annular grooves 34 may be provided in the outer surface of the gland bush. These are provided with a leaky cover 35 for the purpose of conducting the cooling fluid round the periphery of the gland bush.

The improved arrangement also possesses the advantage that it increases the flexibility of the seal and renders the seal itself more effective.

What I claim as my invention is:

1. In a metal extrusion machine having a screw thread impelling device consisting of an inner member and of a rotatably driven outer member, a feed chamber for the supply of molten metal to said device, and a sealing gland for preventing the escape of molten metal between the wall of said chamber and said rotatably driven outer member, a pair of thermal barriers interposed, one on each side of said sealing gland, in the path by which heat is transmitted from the wall of the said feed chamber through said gland to the said rotatably driven outer member.

2. A metal extrusion machine comprising a screw thread impelling device consisting of an inner member and of a rotatably driven outer member, a feed chamber for the supply of molten metal to said device and a sealing gland for preventing the escape of molten metal between the wall of said chamber and said rotatably driven outer member, the end of the rotatably driven outer member adjacent said feed chamber comprising two concentric parts with a closed tubular pocket between them which constitutes a thermal barrier thereby to reduce the transmission of heat from the wall of the said chamber through said sealing gland to the rotating outer member.

3. A metal extrusion machine comprising a screw thread impelling device consisting of an inner member and of a rotatably driven outer member, a feed chamber for supplying molten metal to said device, a bush in the wall of said chamber which receives one end of the rotatably driven outer member and forms with the external surface thereof a sealing gland for preventing escape of molten metal between said bush and said rotatably driven member, said bush comprising two concentric parts with a closed tubular pocket between them which constitutes a thermal barrier for reducing the transmission of heat from the wall of said feed chamber through the gland to the rotatably driven member.

4. In a metal extrusion machine having a screw thread impelling device consisting of an inner member and of a rotatably driven outer member, a feed chamber for the supply of molten metal to said device, and a sealing gland for preventing the escape of molten metal between the wall of said chamber and said rotatably driven outer member, a thermal barrier interposed, on one side of the sealing gland, in the path by which heat is transmitted from the wall of the feed chamber through the gland to the rotatably driven outer member, said barrier lying in the central portion of the path and away from the edges thereof and extending over an area exceeding one quarter of the cross-sectional area of the path in the region of the barrier.

5. In a metal extrusion machine having a screw thread impelling device consisting of an inner member and of a rotatably driven outer member, a feed chamber for the supply of molten metal to said device, and a sealing gland for preventing the escape of molten metal between the wall of said chamber and said rotatably driven outer member, a thermal barrier interposed, on one side of the sealing gland, in the path by which heat is transmitted from the wall of the feed chamber through the gland to the rotatably driven outer member, said barrier extending over an area approximately equal to at least half of the cross-sectional area of the path of heat transmission in the region of the barrier.

6. In a metal extrusion machine having a screw thread impelling device consisting of an inner member and of a rotatably driven outer member, a feed chamber for the supply of molten metal to said device, and a sealing gland for preventing the escape of molten metal between the wall of said chamber and said rotatably driven outer member, a plurality of thin thermal barriers in the form of closed pockets which lie in the path by which heat is transmitted from the wall of the feed chamber through the gland to the rotatably driven outer member.

7. A metal extrusion machine comprising a screw thread impelling device consisting of an inner member and of a rotatably driven outer member, a feed chamber for the supply of molten metal to said device and a sealing gland for preventing the escape of molten metal between the wall of said chamber and said rotatably driven outer member, the end of the rotatably driven outer member adjacent said feed chamber comprising two concentric parts with a clearance between portions of the adjacent surfaces thereof which constitutes a thermal barrier thereby to reduce the transmission of heat from the wall of the said chamber through said sealing gland to the rotating outer member.

8. A metal extrusion machine comprising a screw thread impelling device consisting of an inner member and of a rotatably driven outer member, a feed chamber for supplying molten metal to said device, a bush in the wall of said chamber which receives one end of the rotatably driven outer member and forms with the external surface thereof a sealing gland for preventing escape of molten metal between said bush and said rotatably driven member, said bush comprising two concentric parts with a clearance between portions of the adjacent surfaces thereof which constitutes a thermal barrier for reducing the transmission of heat from the wall of said feed chamber through the gland to the rotatably driven member.

9. A metal extrusion machine comprising a screw thread impelling device consisting of an inner member and a rotatably driven outer member, a feed chamber for the supply of molten metal to said device, a bush in the wall of said feed chamber which receives one end of the rotatably driven outer member and forms with the external surface thereof a sealing gland for preventing escape of molten metal between the said bush and said rotatably driven member, and a thermal barrier, constituted by clearance between a part of the surface of said bush and a part of the adjacent surface of the wall of said chamber, said barrier extending over an area exceeding one quarter of the cross-sectional area of the path of heat transmission in the region of the barrier.

10. A metal extrusion machine comprising a screw thread impelling device consisting of an inner member and a rotatably driven outer member, a feed chamber for the supply of molten metal to said device, a bush in the wall of said feed chamber which receives one end of the rotatably driven outer member and forms with the external surface thereof a sealing gland for preventing escape of molten metal between the said bush and said rotatably driven member, and a thermal barrier, constituted by clearance between a part of the surface of said bush and a part of the adjacent surface of the wall of said chamber, said barrier having the form of a closed pocket whose length in an axial direction exceeds one quarter of the width in an axial direction of the path of heat transmission in the region of the barrier.

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