The invention relates to a method of and apparatus for treating moving matter, and more particularly to a method of and apparatus for extruding metals.

An object of the invention is to provide an improved, simple and efficient method of and apparatus for extruding metals.

Although the invention is capable of various applications, it may be employed to particular advantage in connection with the extrusion of lead alloy cable sheathing.

In accordance with a preferred embodiment of the invention steam is conducted through a portion of the die and is directed onto the cable sheath as close to the formation point of the sheath as possible. This is accomplished by making the face of the die very narrow as compared to the width of the die faces used in some instances in the past, and directing jets of steam under pressure onto the cable sheath adjacent the die.

Other objects and advantages of the invention will become apparent from the following detailed description in connection with the accompanying drawing, in which:

Fig. 1 is a longitudinal vertical section of an extrusion apparatus embodying the features of the invention and by means of which the improved method of extruding may be practiced;

Fig. 2 is a longitudinal vertical section of a die taken along the line 2—2 of Fig. 3;

Fig. 3 is a view of the front end of the die shown in Fig. 1;

Fig. 4 is a view of the rear end of the die locking sleeve nut shown in Fig. 1, and

Fig. 5 is a side view of the die locking sleeve nut shown in Figs. 1 and 4.

Referring to the drawing which illustrates a preferred embodiment of the invention, a core tube 11 is supported within a hollow die block 10. The interior surface of the die block 10 and the exterior surface of the core tube 11 are arranged to provide an annular passage 12 for the material to be extruded. The core tube 11 is supported in the die block 10 and is held in position by a core tube locking sleeve nut 13.

The passage 12 tapers toward the discharge end thereof and communicates with an extrusion die 14. The extrusion die 14 is held in position in the die block 10 by die locking sleeve nut 15.

A cable 16 is advanced through the core tube 11 and die 14 by any suitable means, not shown, and a sheathing of lead 17 extruded on the cable as it passes through the die 14.

In accordance with a feature of the present invention the die 14 is constructed so that the sheath at the point where it leaves the die and the outer surface of the extruding portion of the die is enveloped in a bath of steam at a temperature of approximately 215° F.

Steam velocity upward of 1000 feet per second at the point where the steam passes between the sheath and the die has been found satisfactory.

In an embodiment of the invention constructed and successfully operated the die 14 had four holes 21, 22, 23 and 24 drilled from the front end of the die to communicate with four other holes 25, 26, 27 and 28, drilled from the side of the die. Each of the holes 21 to 24 inclusive communicates with a groove 29 in the front end of the die 14 and each of the holes 25 to 28 inclusive, was drilled through from the side of the die 14 and communicates with a groove 30 just forward of the sheath forming face 31 of the die.

The die locking sleeve nut 15 has a hole 32 extending from the front face thereof to the rear thereof and communicating with the groove 30 in the die 14.

Steam at a pressure preferably between 50 and 100 pounds is supplied to the apparatus from any suitable source, not shown, through a valve 33 and a supply line 34 to the aperture or hole 32 of the die locking sleeve nut 15. The steam passes through the hole 32 in the die locking sleeve nut 15 into and around the groove 29 in the front of the die 14, into the apertures or holes 21 to 24 inclusive and the apertures or holes 25 to 28 inclusive. The steam emerges from the apertures or holes 25 to 28 inclusive at a pressure between 20 and 40 pounds and strikes the sheath 17 and front portion of the sheath extruding face 31 of the die 14, passes into and around the groove 29 in the die 14 and between the sheath and gradually flaring front portion 35 of the die and die locking sleeve nut and out into the atmosphere as indicated by the arrows in Fig. 1. This maintains the steam in contact with the sheath 17 for a considerable distance after the sheath 17 leaves the sheath forming face 31 of the die 14.

In several embodiments constructed for use in applying a lead-antimony sheath on various size cables the grooves 29 were ⅜ inch in width 50 and ranged between 3⅛ and 5⅛ inches in diameter. In each case the diameter of the holes 21 to 28 inclusive was ⅜ of an inch. A pressure at the valve 33 of approximately 90 pounds has been found to reduce the temperature of the 55
die 14 at a point near the groove 29 from 375–400°F. to 210–220°F., while the lead alloy being extruded is maintained at a temperature of 400–450°F. and has been found to produce velocities in the steam in contact with the newly extruded surface immediately behind the forming face 31 estimated to be upward of 1000 feet per second. The use of steam under the conditions employed removes all traces of material (which with other methods formerly employed collected at the outer face of the die) from the face of the die and maintains it in a clean condition. This results in a more perfect cable sheath as the scratches caused by particles adhering to the face of the die are eliminated.

The use of steam in the die as shown and described above made it possible in one particular instance to use a reclaimed lead-antimony alloy with which it was found impossible to produce a satisfactory cable sheath by the methods and apparatus employed in the past. While it is not known just what the use of steam does to make it possible to use grades of alloy not possible by methods formerly used, it is known that in all cases tried the use of steam as described has produced equal, if not superior cable sheath with all grades of alloy. The use of steam has also made it possible to increase the extrusion speed between 10 and 20% with fewer die block cleanings as the steam has a tendency to remove particles of oxide and other foreign materials from the sheath forming face of the die.

The use of steam in the manner outlined is superior to the use of water or air in at least one respect. Water or air, if used in the manner described above for steam would cause the lead-antimony charge in the die block to solidify if the flow of water or air is not stopped during intervals while the extrusion press is not in operation, such as the intervals in which it is being refilled. The steam can be left on for any length of time without causing the charge to solidify. The use of air in place of steam has another disadvantage, in that the air may cause the outer surface of a lead-antimony sheath to become oxidized.

While a single embodiment of the invention has been shown and described in detail, it is to be understood that the invention is generic in character and is not to be construed as limited to the particular embodiment disclosed, since numerous modifications thereof may be made by persons skilled in the art, without departing from the spirit and scope of the invention which is to be determined by the appended claims.

What is claimed is:
1. In an apparatus for extruding material, an extruding die having an aperture therethrough the inner wall of which presents a material forming face extending around the aperture and a fluid distributing groove also extending around the aperture immediately behind the forming face and an exit passage flaring away from immediately behind the groove, in combination with means to supply a fluid to the groove.
2. In an apparatus for extruding material, an extruding die having an aperture therethrough the inner wall of which presents a material forming face approximately one sixteenth inch in width extending around the aperture and a fluid distributing groove also extending around the aperture immediately behind the forming face and an exit passage flaring away from immediately behind the groove, in combination with means to supply a fluid to the groove.
3. In an apparatus for extruding material, an extruding die having an aperture therethrough the inner wall of which presents a material forming face extending around the aperture and a fluid distributing groove also extending around the aperture immediately behind the forming face and an exit passage flaring away from immediately behind the groove, in combination with means to supply a fluid to the perforations.
4. In an apparatus for extruding material maintained at a relatively high temperature, an extruding die having an aperture therethrough the inner wall of which presents a material forming face extending around the aperture and a fluid distributing groove also extending around the aperture immediately behind the groove, and the die having perforations through the body thereof communicating with the groove, in combination with means to supply a fluid to the perforations, whereby the die is maintained at a relatively low temperature and the extruded material is immersed in the fluid immediately upon leaving the forming face.
5. The method of forming an article of an alloy containing lead and antimony being maintained at a temperature exceeding 350°F. which consists in extruding the alloy through a die, maintaining the die at a temperature below 250°F., and simultaneously submerging the article in a fluid maintained under non-oxidizing conditions of temperature and pressure and a velocity greater than 1000 feet per second.
6. In an apparatus for extruding material maintained at a temperature of the order of 400°F., an extruding die having an aperture therethrough the inner wall of which presents a material forming face extending around the aperture and a fluid distributing groove also extending around the aperture immediately behind the forming face and an exit passage flaring away from immediately behind the groove, and the die having perforations through the body thereof communicating with the groove, in combination with means to supply a steam to the perforations, whereby the die is maintained at a temperature of the order of 225°F. and the extruded material is immersed in the steam immediately upon leaving the forming face.

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