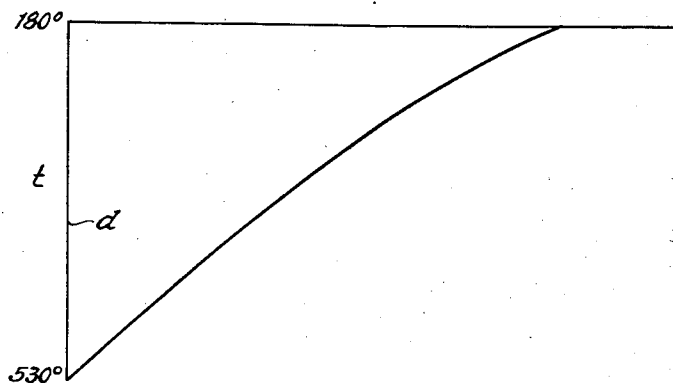
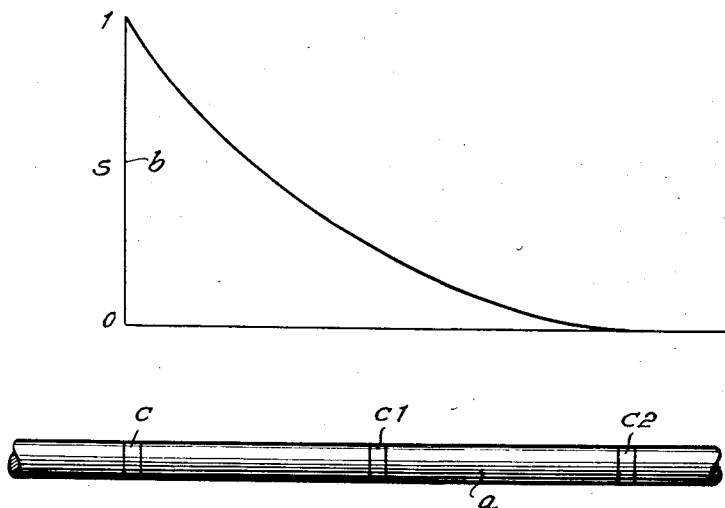


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E. EMMERICH
METHOD OF DISCONTINUOUSLY SHEATHING
HEAT-SENSITIVE CABLES OR THE LIKE
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INVENTOR
E. Emmerich
By *Glenn Downing* *Subst.*
ATTYS.

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METHOD OF DISCONTINUOUSLY SHEATHING HEAT-SENSITIVE CABLES OR THE LIKE

Ernst Emmerich, Koln-Bruck, Germany, assignor to Schloemann Aktiengesellschaft, Dusseldorf, Germany

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2 Claims. (Cl. 207—10)

In the sheathing of heat-sensitive cables or the like with heated materials, for instance lead or aluminum, two requirements present themselves, which are almost incompatible. For reasons governing deformation the temperature of the material to be dealt with must be as high as possible, as with increasing temperature the work required for the deformation becomes less. For this reason a temperature of about 250° C. is aimed at in the pressing of lead, whilst for economically pressing aluminum temperatures of about from 450 to 530° C. are aimed at.

On the other hand heat-sensitive cables, more particularly their outer insulating layer, will not stand too intensive a heating, as they will otherwise be damaged. Insulating material based on synthetic substances, such as polyethylene and styroflex are already heat-sensitive at temperatures of 150° and 75° C. respectively. The sensitiveness to heat is, of course, dependent on the duration of the action. Hence it is possible to sheathe even relatively heat-sensitive cables or the like with aluminum of fairly high temperatures, for instance of 530°, when the pressure is applied very rapidly and small wall thicknesses are adopted, with which the amount of heat continuously given off can be conveyed away to a sufficient extent. The cable will then run through the danger zone so rapidly that the time will be insufficient for any appreciable damage to the cable. It is, of course assumed that all known means for cooling are properly applied, that more particularly the mandrel is cooled right to the point, that the matrix is cooled and that the cable sheathing being formed is cooled down immediately behind the matrix, for instance by being sprayed with water.

The method referred to thus enables the production of sheathed cables to be carried out only in such a length as can be carried out without the interruption of a high pressing velocity. For sheathing, however, presses are preferably used in which the material operated on is placed in a container and is pressed out by a plunger. After the contents have been forced out of the container an interval must be interposed, during which the press plunger is withdrawn and fresh material is introduced. When the container is very large, a relatively long cable can be produced with great speed, but with a smaller container the length of the cable that can be produced diminishes in proportion to the volume of the container used. Large containers, however, require great pressing forces, so that the production of long cables with the aid of such presses is only possible when very large presses are used.

The invention has for its object, to produce discontinuously cable sheathings of any length, that is preferably with the aid of presses operating with a container and plunger, the arrangement being such that several container charges can be pressed out one after the other, without damage due to heat to the cable insulation occurring at the stopping places referred to.

According to the invention this is effected by the pressing speed being reduced before each stopping period grad-

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ually in such a manner that the cable is exposed to the temperature of the sheathing as it forms, which diminishes owing to the cooling, each time only as long as its material will stand it without being endangered. Hence, shortly before the start of the stopping period the pressing speed is gradually reduced. There is therefore an increase in the length of time during which the heat of the sheathing in formation, of the mandrel and of the matrix acts on the section of cable as it runs through. At the same time, however, the temperature of these heat-radiating materials decreases slowly, as mandrel, matrix and cable sheathing are continuously further cooled. Hence, whilst the period of the heat action on each cable section becomes longer, the effective temperature drops at the same time and with it the amount of heat conveyed in unit time.

Through the employment of the method according to the invention it becomes possible, even when using high pressing temperatures, to apply lead and aluminum sheathing round heat-sensitive cables under pressure with great pressing speeds and at the same time to interpose intervals of several minutes for the purpose of adding fresh material. For example, it was found possible with a temperature of the aluminum charge of 540° C. and a temperature of the recipient of the press of 530° C. to press round a cable of 20 mm., insulated with dry or impregnated paper, an aluminum sheath having a wall thickness of 1 mm. and to observe stopping periods of several minutes. No damage through heat action of the insulation was caused. The pressing velocity was found to be preferably 10 cm./sec. This velocity was during one minute continuously reduced to zero, followed by a period of rest of several minutes.

Now, if a period of rest of any duration, for instance of one hour or more, is to be interpolated, this is also possible, if the temperature at the sheath-forming place be kept about constant at that which the cable will just stand. As the heat supply from the recipient cannot be influenced, this is effected by the expedient of throttling the cooling medium supply in such a manner that the existing temperature which the cable is just capable of standing is not exceeded, but is substantially maintained; for the avoidance of excessively low temperatures is also necessary for enabling pressing to be resumed.

The regulation of the temperature is facilitated, if in the mandrel point and/or the matrix one or more thermocouple elements be built in, which enable the temperature to be controlled. It is also possible to cause the supply of cooling medium to be directly automatically regulated by the thermocouple elements.

The attached diagram serves the purpose of elucidating the invention.

Let *a* indicate the cable to be sheathed. On the ordinate *b* the velocities *s* are plotted, with which the individual cable sections *c*, *c*₁, *c*₂ are drawn through the cable sheathing plates. The cable is normally run quickly, that is to say, in the illustrated example with the velocity *s*=1.

While the section *c* of the cable is running through the cable sheathing place, a start is made with the reduction of the cable velocity. At the same time the temperature starts to fall, being already substantially reduced at *c*₁, whilst the section *c*₂ is the one in which the cable is brought to rest. Thus, at this place the place of junction between the expression of two recipient charges is formed, which is usually referred to as bamboo ring or stopping place. On the ordinate *d* the temperatures are plotted, which during operation prevail in the sheath-forming region. It is assumed that normal pressing proceeds at a temperature round about 530°. Now, if according to the invention the velocity with which the cable runs through the sheathing place is reduced within one

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minute from 1 to 0, the temperature will also drop, as the supply of the cooling medium to the matrix, to the mandrel point and to the sprinkler remains unchanged. The temperature will therefore drop rapidly, so that the section c1 of the cable will already be sheathed at a considerably lower temperature than the section c. The sheathing takes far longer, however, than the sheathing of the section c. When the velocity becomes 0, the temperature of 180° will be about reached. This temperature no longer damages many insulating materials, even when it acts on the material for a considerable time, for instance for 1 hour. By throttling the supply of cooling medium it then becomes possible to cause the temperature of 180° to be maintained for some time, as then the heat supply from the recipient and the heat dissipation by the cooling devices will balance one another. If the temperature of 180° be maintained, it will be possible at any time to continue the pressing, without appreciable damage to the cable through shrinkages due to excessive cooling.

I claim:

1. A process for high temperature extrusion of successive billets to form a continuous metal sheath onto a cable having a heat-sensitive covering without damaging the covering, particularly during replacement of billets, said process comprising the steps of feeding said cable at a predetermined linear speed, extruding a metal billet at an optimum temperature considerably above the critical temperature at which said covering would be damaged by prolonged exposure to such optimum temperature and at a speed related to said predetermined speed to form said sheath about said cable, cooling said sheath during said extrusion at a location immediately following the zone of extrusion at a constant rate to cool said sheath to a temperature just below that effecting damage to said cover-

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ing, continuing said cable feeding, extrusion and cooling at a substantially constant speed until the major portion of said billet has been extruded, gradually and continuously reducing the speed of extrusion and cable feeding to zero at a predetermined rate while continuing cooling at said constant rate which cooling due to the predetermined rate of speed reduction operates to lower the temperature of said sheath in the zone of extrusion to a temperature slightly below the critical temperature of said covering to prevent damage to said covering when the extrusion and cable feeding finally stop, said lower temperature being sufficiently close to said critical temperature to permit efficient resumption of said extrusion operation, positioning another billet for extrusion, resuming the cable feeding and extrusion operation at said predetermined speed and optimum temperature while continuing said constant cooling and repeating the process to provide a sheathed cable of the required length.

2. A process as defined in claim 1, in which said predetermined linear speed is approximately ten centimeters per second and in which said speed is reduced to zero through a period of approximate one minute.

References Cited in the file of this patent

UNITED STATES PATENTS

2,105,083	Kagi et al. _____	Jan. 11, 1938
2,135,193	Moorhead _____	Nov. 1, 1938
2,161,570	Harris _____	June 6, 1939
2,207,405	Jacobson _____	July 9, 1940
2,219,888	Duclos _____	Oct. 29, 1940
2,385,574	Hyprath _____	Sept. 25, 1945

FOREIGN PATENTS

123,827	Australia _____	Mar. 27, 1947
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