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MANUFACTURE OF SPINNING NOZZLES

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The invention relates to the manufacture of spinning nozzles.

The main object of the invention is to produce spinning nozzles consisting of gold-platinum alloy of high tempering hardness and great resistance to mechanical stresses and which are not so liable to close up or clog as the known nozzles.

A further object of the invention is to furnish nozzles having thinner walls and of greater durability than the nozzles known hitherto, whereby a saving is effected both in the amount of precious metals employed and the quantities of nozzles it is necessary to keep in stock as spares.

Another object is to provide a process for manufacturing such improved nozzles.

The spinning nozzles according to the invention are essentially characterised in that their platinum contents exceed 32% of the total alloy and amounts to for example, 35–60%.

For the manufacture of spinning nozzles for the artificial silk industry gold-platinum alloys have hitherto been used having a platinum content up to 30%. Alloys with 30% platinum have especially proved suitable. They have a high tempering hardness and great durability under actual working conditions, further, the tendency of the bore holes to close up in working is comparatively slight in these nozzles, but despite this an increase of the platinum content is desirable as this enables one to expect a further increase in hardness of the gold-platinum alloys in their tempered condition.

Hitherto no one has ventured to increase the platinum content of these nozzles, owing to the fact that it was anticipated that if the platinum content were raised this would result in considerably increasing the difficulties in finishing the nozzles, especially in regard to the producing of the nozzle orifices, insomuch as the quenching hardness rises proportionately with the increase in the platinum content, and hitherto the nozzles were always drilled in the quenched condition.

It is known that alloys for the purpose of tempering are quenched at a high temperature as near as possible to the lower melting point curve and then heated to a considerably lower temperature. As however it is an extremely difficult task to produce the fine orifices in the nozzles in their tempered condition owing to their great hardness, which operation has in some cases proved impossible, the drilling is carried out when they are in the quenched condition and not until the drilling is completed are they heated again for hardening purposes. For this reason it must be assumed that the increase in quenching hardness due to the increase in quenching hardness due to the increased platinum contents would render drilling impossible, as comparative tests had shown that an alloy containing 40% platnum possessed a tempering hardness of 315 Brinell units and a quenching hardness of 170 Brinell units, whereas the same figures for the gold-platinum alloy hitherto used i. e. 30% platinum and 70% gold were maximum 200 Brinell units and about 100 Brinell units at a tempering temperature of 550° centigrade.

When increasing the platinum content to 50%, the tempering hardness rises to 380 Brinell units and the quenching hardness to about 260 Brinell units.

On further increasing the platinum contents to 60% the tempering hardness amounts to approximately 420 Brinell units and the quenching hardness to about 330 Brinell units.

Increased to 65% platinum content, the alloy has a tempering hardness of 440 Brinell units and a quenching hardness of about 330 Brinell units.

It was found, however, that despite this considerable increase in quenching hardness gold-platinum alloys having a higher platinum content than 30% could be used, and that further the nozzles so produced possessed various advantages, as it was discovered that where the platinum content exceeded 32% the alloy was so exceedingly fine grained that such fine bores as are required for spinning nozzles could be produced without trouble despite their greater hardness and that these bores were even smoother walled than it was possible to make them hitherto.

Researches have shown that this fineness of grain of the gold-platinum alloys increases as the platinum content increases reaching its maximum at about 55% platinum content.

This fact having been established alloys containing more than 40% platinum are now used with advantage, e. g. such as contain about 45 to 60%. The tempering hardness of these alloys lies between about 320 or 350 to 420 Brinell units. The great quenching hardnesses of these alloys which were mentioned above strangely enough offer no obstacle to drilling the nozzles made of these alloys in the quenched condition, insomuch as has already been stated the fineness of the grain renders them comparatively easy to work.

However, the nozzles can also be drilled after a special annealing. It has been that good results are obtained when e. g. the nozzles are

drilled after an annealing at medium temperatures, i. e. from about 600 to 900° C. and thereafter heated in manner known to high temperatures, e. g. 1100 to 1240° C. then quenched and finally tempered by reheating the finished nozzles to lower temperatures, say 525–575° C. for example 550° C.

The fact is that during such annealing treatment at medium temperatures the hardness of such alloys having a higher platinum content increases only very slightly. Thus taking as an example an annealing at about 800° C. the degree of hardness of alloys having about 35 to about 65% platinum lies between only approximately 100 and 120 Brinell units.

In a practical application of this process the procedure may be as follows: the nozzles are first annealed at somewhat high temperature, say 900 to 1100° C., for example 1000° C., in order to eliminate mechanical stresses, and then the annealing temperature is reduced to that which at which temperature the drilling of the nozzles is then carried out.

It is surprising that such annealing treatment prior to the drilling should give good results, seeing that previous experience has shown that when using known spinning nozzle alloys, the orifices are rendered useless when heated to high temperatures, whereas in the present case the preannealed nozzles must, subsequent to the drilling, also be exposed to high temperatures of about 1150 to 1250° C. for the purpose of tempering.

However, when carrying out the present process it was found that owing to the extraordinary fineness of grain of the alloys having higher platinum contents, the nozzle orifices are not disadvantageously modified by the subsequent heating process. It is sufficient to smooth or polish the bores after the usual quenching, e. g. by means of reamer needles. In fact the quality of the orifices and bores is even better than in nozzles made from the hitherto used gold-platinum alloys.

Owing to their greater tempering hardness the spinning nozzles made according to the invention possess considerably greater resistance to mechanical stresses. The walls of the nozzles can be made thinner, thus saving precious metals. The nozzles are considerably more durable, and this characteristic makes it possible to have smaller quantities of the precious metal nozzles in stock as spares.

Owing to the greater smoothness of the bores and perhaps also due to the different composition of the alloys, the nozzles when in use show a still smaller tendency to close up in the bores than those made of the hitherto used alloy in the proportion of 70% gold to 30% platinum. The nozzles therefore do not need to be replaced very often on account of closing up of the bores or clogging. Thus stoppages and breakdowns are avoided or reduced in number, and in addition the finished products will be of greater uniformity as regards quality.

The gold-platinum alloys used according to the invention can finally contain slight quantities, e. g. 1% and up to 3% of at least one other metal of the platinum group. A percentage of rhodium has proved particularly suitable.

By means of these additional metals the alloys can be improved in various ways, and in particular these additions facilitate the work of finishing during certain manufacturing stages.

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