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ASBESTOS FRICTION CLUTCH RING.

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This application is a continuation in part of an original application filed by me May 28th, 1920, Serial No. 384,901, issued under date of April 3rd, 1923, as Patent No. 1,450,319.

Among the salient objects of the invention are to make a friction clutch ring suitable for use in motor cars which will have the necessary hardness, co-efficient of friction and will not be affected by high temperature induced by slippage of the clutch and which will not be affected by oils or water; to provide a product of the above character which is tough and more or less flexible and will withstand braking strains; to provide a product in which the saturating medium for the asbestos consists of an asphalt-containing oil which is or may be heavy Mexican crude which is relatively cheap.

Heretofore expensive saturants or binders as linseed oil and drying oils thinned down with gasoline have been used. This invention obviates the use of a drying oil and gasoline and permits of the use of a very cheap petroluem oil, thus markedly reducing the cost of production. I thus use a non-drying mineral oil of asphaltic base such as Mexican crude of 12° Baumé gravity.

The invention may be carried out as follows: I first preferably form the ring of unwoven felted asbestos in the manner set forth in U. S. Patent No. 1,301,612, issued to S. Simpson, or it may be a molded unwoven ring. If desired, the woven asbestos covered wire rings may be used.

These rings are immersed in a tank containing Mexican crude petroleum of say 12° Baumé gravity which has been thinned or cut back with about 20% of gas oil as for example, mid-continental gas oil of from 32° to 34° Baumé. The use of this rather volatile gas oil facilitates saturation and tends to prevent the asphaltic oil from bleeding out of the ring during the baking operation hereinafter described. The contents of the tank are heated to about 350° F., and the rings kept in the tank about two hours. The rings are then removed and the excess of saturant allowed to drain from the rings while the rings are still kept in a heated condition not below 200° F.

At this stage the rings will have taken up about 35% to 40% by weight of saturant. The rings are then transferred to a baking oven and there subjected to a baking operation. Starting with a temperature of about 300° F. the heat in the oven is slowly and gradually raised over a period of approximately 12 to 18 hours more or less to about 500° F. Care must be taken not to raise the temperature too fast or else the saturant will bleed out, forming an impermeable film on the surface which prevents proper curing.

The oven is provided with an exhaust fan for driving out volatile products such as the gases and fumes and effective ventilation is also provided to permit the free access of air. This latter is necessary to insure proper curing. At this stage of the curing, the rings are still relatively soft and weak and the asphalt is still also soluble in the usual solvents.

After the temperature of 550° F. has been reached the curing is continued for 24 to 48 hours additional treatment at the same temperature.

At the end of the second stage of the baking operations, the asphalt has been so altered that it is entirely insoluble in the usual solvents such as kerosene or carbon tetrachloride. The length of the baking operation is determined by testing one of the rings with the above solvents.

These rings have all of the advantages and characteristics heretofore set forth in the objects of invention. The finished rings have a Brinnell hardness of from 15 to 25 and a tensile strength upwards from 2000 to 3000 pounds per square inch. Care should be taken during the curing operation to keep the temperature uniform and particularly an excessive temperature (much above 600° F.) should be avoided. The volatilized and oxidized vapors should be promptly withdrawn from the oven so as to permit free and effective access of fresh air to the rings. If desired, the rings may before saturation, have incorporated in them during their formation an oxidizing agent such as red oxide of lead to the extent of say 3% to 5%.

The following specific illustration of actual operation of the invention may also be given. The dry asbestos rings, after being calendered were saturated for a period of about one hour in heavy Mexican asphaltic residuum contained in a vehicle of mid continental petroleum gas oil. About 80% of the Mexican residuum was used to about 20% of gas oil. The gas oil not only facilitates saturation but prevents the surface of the ring from being prematurely sealed off on initial baking and polymerization of the asphalt. In other

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words, the gas oil prevents a surface baking which will prevent the heat from entering the interior of the ring. The saturating solution was heated to a temperature of about 300° F. and the rings kept in the tank for one hour. The rings were then removed and put into the baking oven, starting with a temperature of 200° F. and was steadily raised to a temperature of 500° F. in five hours and held at such temperature for about twelve hours.

The rings were then removed and resaturated in a similar saturating solution and then rebaked as before except that the temperature was started at about 500° F. and the rings baked for about twelve hours.

The rings were then put into a press and squeezed together to straighten them out and kept in the press until cooled.

The rings made in this manner have a tensile strength of approximately 2000 where a double saturation and double baking were used and a Brinnell hardness of over 20. Where only one saturation and one baking is used the tensile strength and Brinnell hardness will be considerably less.

Rings made in the same way as the above except that the asbestos pulp contained lead oxide with double saturation and double baking, had a tensile strength of about 2700 and approximately 20 Brinnell hardness and where a single saturation and single baking were used a very considerable less amount of tensile strength was obtained. Where double saturation was used the average per cent of saturation relative to the weight of the dry rings was about 20%, more or less.

It is to be clearly understood that the invention may be carried out in the manner described in said former application which is made a part of this present application but that the illustrative operation given shows an actual carrying out of the process.

I claim as my invention:

A friction clutch ring consisting of a substantially incombustible unwoven facing saturated with a bituminous binder, to-wit: heavy Mexican asphalt heat treated to the extent to make the binder substantially insoluble in asphaltic solvents, and to a hardness in excess of 15 and a tensile strength in excess of 2,000.

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