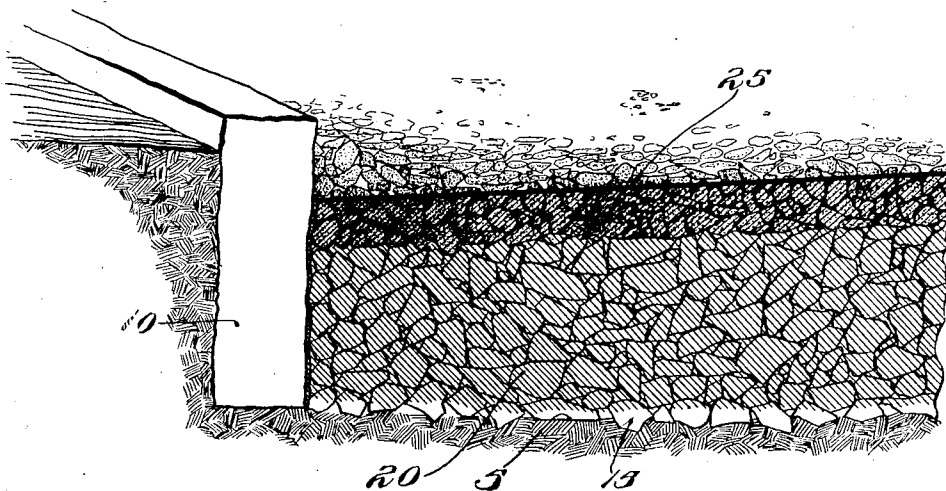


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PROCESS OF MAKING SAFETY TREADS.
APPLICATION FILED FEB. 14, 1919.

1,371,684.

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PROCESS OF MAKING SAFETY-TREADS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GEORGE N. JEPSON, a citizen of the United States of America, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Processes of Making Safety-Treads, of which the following is a full, clear, and exact specification.

My invention relates to anti-slipping, wear-resisting pavement treads and to processes of making safety treads.

There are certain essential characteristics which should be found in a good road. It should be economical as to first cost and maintenance. It should be adapted to the grade and suited to the particular traffic or wear for which it is intended. It should be substantially impervious to moisture, and of such nature that it will not be injured by climatic and temperature changes. It should be smooth surfaced, dustless, mudless and easily cleaned. It should be hard, tough, durable and resistant to crushing, abrasion and disintegration under pedestrian and traffic wear. Most essential of all, it should give a good foothold to pedestrians and horses and be anti-slipping to motor vehicles to prevent accidents.

It is well known that asphalt, concrete, and wooden pavements and surfaces covered with tar or various bituminous preparations are slippery when wet or dirty. It is customary to sprinkle sand or similar anti-slipping materials on such roads, but the loose grains tend to wear out the surfacing and are objectionable. The more durable pavements of blocks of granite or similar stones wear down to a smooth polished surface and so become slippery especially in damp weather when there is a scum of grease or moisture present. The less slippery pavements of earth and gravel are of course short lived and are not suitable for heavy traffic.

It is accordingly an object of my invention to overcome these difficulties and to provide a tread particularly adapted for roads which always presents an anti-slipping and yet a hard and durable surface capable of resisting traffic wear and abrasions for a long period of time. A further object is to provide a simple and economical process of making the anti-slipping material and incorporating it in a tread.

With these and other objects in view as will be apparent from the following disclosure, my invention resides in the construction and the steps of a process set forth in the accompanying specification and covered by the claims appended hereto.

It has been proposed to incorporate silicon carbid grains in a concrete road by mixing the grain with the cement material. Owing to the poor bonding qualities of cement and the fact that silicon carbid fractures and crumbles away easily, these hard grains will not be retained for any length of time in the road surface, and consequently will not serve as an anti-slipping and wear-resisting material. On the other hand, crystalline material of a hardness of 9 or more on Moh's scale possesses excellent anti-slipping qualities and I have found a way in which such materials may be utilized in road construction.

In accordance with my invention, I bond together into a unitary mass or conglomerate a large number of grains of crystalline alumina such as corundum, emery, electrically fused alumina etc., which may contain various impurities, or silicon carbid, or similar substances, preferably of a hardness of 9 or more, which have large anti-slipping and wear-resisting qualities; and I use such a bonded mass as a slip-proof aggregate for embedding in a suitable cementing material to form a compound conglomerate adapted for a tread or pavement. These hard materials, ordinarily obtainable in large masses, are crushed to form small grains of desired sizes, it being found preferable to use grains of 36 mesh and finer.

In order that the aggregate may have the desired qualities, I utilize a bond for the crystals, which will hold the grains in place almost indefinitely, which will resist the abrasions, strains and impacts of traffic and pedestrian wear without breaking or permitting the grains to become loose in their settings and which will form an exceedingly hard mass, preferably of irregular shape and large surface area, capable of firmly uniting with cementitious tread or road-building material. Of the various available materials, I prefer to use bonds well known in the ceramic art, which vitrify or become glassy at kiln temperatures. Depending upon the nature of these bond mixtures, the proportions of the ingredients and their

treatment, one may obtain either soft or hard vitrified or glassy products. As an illustration of a bond adapted to form an artificial stone substantially as hard as trap rock a ceramic clay material of the following composition may be utilized:

	Slip clay-----	44 parts by weight
	Feldspar -----	44 parts by weight
10	Ball clay-----	12 parts by weight

These ingredients may be crushed and mixed dry in desired proportions with the crystals, which are preferably of alumina. This mixture is then rendered plastic so as to be shaped conveniently for handling and firing. This may be accomplished by dampening the mass with water sufficiently to form it by the dry press process into lumps or shapes of convenient size. I find it desirable in certain instances to form these shapes in an auger type brick machine. These lumps, which are preferably made as briquets of a given size and shape in order that the product obtained from the kiln may be uniform in nature, are burned or heated in a tunnel or other variety of kiln for a suitable time and under a degree of heat which depends mainly on the nature of the bond, the temperature, the size of the kiln and the size and shape of the lumps. This firing operation is carried on until the bond is vitrified, it ordinarily consuming from 50 to 100 hours at a temperature approximating 1300° centigrade when a slowly burned product is desired. The hard burned mass is then cooled slowly for a suitable length of time and thereafter reduced to the required sizes, as for example by being broken by rolls or in a rock crusher to form irregularly shaped pieces or aggregate of suitable sizes, ordinarily ranging from $\frac{1}{4}$ inch in thickness to 2 inches, depending upon the character of wear to which the material will be exposed.

In order to form a wear-resisting tread surface capable of use for pedestrian wear or as a road I form a compound conglomerate by incorporating these conglomerate chips or shapes in a suitable bond or cementitious medium capable of holding them in place when subjected to the desired use. As a specific example of the application of my invention to pavement constructions, reference is to be had to the accompanying drawing showing a section in perspective of a concrete road having a slip-proof surface layer thereon.

To provide a foundation for such a road surfacing, one may excavate sufficient material from the roadbed to remove the surface soil, decaying matter and similar substances and preferably to reach a satisfactory base material. This sub-grade is formed to the proper grade and cross section and is thoroughly compacted as by rolling to a firm

and even surface, the various depressions and unevennesses in the grade being leveled off during the operation. The curbstones may be then put in place and the necessary steps taken to provide for gutters, expansion joints, wire netting reinforcements etc. If as illustrated, the foundation material consists of concrete, various well known methods of making the same may be adopted. One type of road may be made by first putting down a layer of crushed stone of a tough material of good binding properties, such as trap or granite, although such materials as limestone, mica schist, quartz, etc., may be used, depending largely upon what is available in the immediate vicinity. This crushed stone should be thoroughly rolled under heavy pressure until the stones are wedged or interlocked in place. While such a base layer may be omitted and the concrete road laid on the sub-grade it is considered that this provides drainage for water absorbed by the road, and so is desirable. It, of course, is obvious that various other steps should be taken to provide for adequate drainage, depending upon the character of the sub-grade and the nature of the materials used.

The main body of the road may be laid on this base layer according to various methods. A simple procedure involves rolling successive layers of stone and cementing them together. Portland cement mortar, made for example of one part of sand to one part of cement suitably moistened with water, may be spread over this rolled stone surface and brushed as much as possible into the interstices between the aggregate, after which the mass may be again rolled if desired. Another layer of crushed rock may be then rolled in place and a further application of grout made, this being continued until the foundation is of sufficient thickness for standing the strains of traffic. If desired the rock may be mixed with the cement, sand and water in an ordinary concrete mixer and laid in place as one or more layers. The proportions of the ingredients may be varied as is well known in the art.

In order to make this concrete road anti-slipping, I provide a top surfacing comprising my ceramic bonded chips suitably embedded in a cementitious matrix to form a conglomerate. This matrix may comprise various substances suitable for roads, such as hydraulic cement, asphalt or tar preparations, depending upon the type of road desired. If the surface is for pedestrian wear, such cements as magnesium oxychlorid, resinous or bituminous bonds may be used depending upon the degree of exposure to the weather, the nature of the frictional wear, the stresses, etc., to which the tread will be subjected. If Portland cement is used, the top layer is preferably laid before the con-

crete foundation has become hard, or else this foundation is thoroughly cleaned and brushed over with a thin cement mixture, after which the top dressing is added. The anti-slipping aggregate may be mixed with cement and water with or without sand to form a conglomerate.

Various procedures may be adopted in laying this top dressing 25. For example, the concrete aggregate should be mixed preferably for two or three minutes and poured upon the foundation before the mortar filling beneath it has set and then be tamped until the aggregate has assumed a stable position and a slight surfacing of water is noted. If desired, one may roll the anti-slipping aggregate into place on the top of the concrete foundation, and then grout it with a suitable cement mortar. One or more layers may be laid in this way, depending upon the amount of traffic to which the material will be subjected, the lower one being thoroughly rammed into the concrete. It is advisable, however, that the total layer 25 be at least 2" thick. In certain cases, a layer of smaller trap rock may be placed on the foundation layer and thoroughly rammed into the concrete foundation to insure good contact, then a top layer containing the anti-slipping aggregate be applied immediately, thoroughly compacted and then trowled or shaped to conform to the grade and cross section of the street. When sufficiently hard the surface may be floated and steel-troweled and the depressions filled. If it is desired to incorporate these anti-slipping fragments or aggregates with asphaltum the two may be mixed together while the asphaltum is hot and the same applied to a suitable foundation in the manner in which asphaltum is now laid.

The size of these anti-slipping pieces may obviously be varied depending upon the type of surface desired for the road. As illustrated in the drawing, the aggregate may average smaller than the trap rock below it. By utilizing aggregates comprising the run of the mill which will pass through a 2" ring, but preferably omitting the extremely fine sizes, one may obtain a road surface which may be compacted to a good anti-slipping surface suitable for heavy traffic. This mixture may be made up in such proportions that the cement will fill the voids between the aggregate when laid with a slight excess of mortar left over. On the other hand, the aggregates should be of such sizes and in such proportions as to constitute the major portion of the tread surface, so as to receive the traffic wear and protect the cement or outer bond from unusual abrasions. Due to the extensive surface of these fragments and the fact that they are porous and have numerous fine projections on the surface, they unite very

firmly with the cement and so do not become easily dislodged from the face of the road.

In accordance with this invention, I have provided a compound conglomerate comprising a cement body having embedded therein an irregularly shaped, rough surfaced, anti-slipping conglomerate of crystalline grains of a hardness of 9 or more unitarily bonded, preferably by a ceramic clay material vitrified or rendered glassy in a ceramic high temperature kiln.

What I claim is:—

1. The process of making a safety tread comprising bonding anti-slipping grains of extreme hardness with a material capable of forming a hard, wear-resisting mass and bonding pieces of said conglomerate mass with a cementitious tread magma to form a compound conglomerate in which said pieces are adapted to receive the tread wear.

2. The process of making an anti-slipping tread comprising bonding hard, anti-slipping grains by means of a ceramic material capable of forming a wear-resisting mass and forming a compound conglomerate of these bodies with a cementitious mass in which the bonded grains are adapted to receive the tread wear.

3. The process of making an anti-slipping tread comprising bonding small crystalline grains of a hardness of 9 or more with a vitrified ceramic bonding material and embedding these bodies irregularly in a stone-forming medium to provide a compound conglomerate in which the bonded grains constitute the major portion of the tread surface.

4. The process of making a tread comprising bonding hard, anti-slipping crystalline grains with a bonding material capable of resisting wear to form a conglomerate, crushing said conglomerate into fragments of irregular shape and size, selecting those fragments which contain many bonded grains and bonding these conglomerate fragments in a cementitious body to form a compound conglomerate in which the fragments serve to receive the larger proportion of the tread wear.

5. The process of making an anti-slipping, wear-resisting tread comprising the steps of bonding small crystalline grains of a hardness of 9 or more with a vitrified ceramic material to form a wear-resisting, anti-slipping conglomerate mass; crushing this mass into irregularly shaped pieces of conglomerate and bonding said pieces in a cementitious body to form a compound conglomerate in which the ceramic bonded grains receive the traffic wear.

6. The process of making a tread comprising bonding crystalline alumina grains with bonding material capable of forming a wear-resisting stone-like mass, and embedding small pieces of this conglomerate mass

irregularly in a cement to form a compound conglomerate suitable for use as a tread surface.

7. The process of making an anti-slipping tread comprising bonding crystalline alumina grains with a ceramic bonding material into an irregularly surfaced porous mass and embedding chips of the bonded material in cement to form a tread in which the chips form the major portion of the wear-receiving surface.

8. The process of making a tread comprising mixing crystalline alumina grains with a vitrifiable ceramic material capable of bonding the grains into a hard, wear-resisting mass, shaping the same into a definite form, burning the shape in a ceramic kiln to produce a vitrified mass, crushing this vitrified mass into aggregates of varying sizes containing a plurality of crystalline grains which form rough, irregular, anti-slipping surfaces and bonding a plurality of these conglomerate pieces with cement to form a tread having the anti-slipping pieces irregularly spaced therein which is capable of resisting wear and preventing slipping thereon.

9. The process of making anti-slipping material comprising bonding hard, anti-slipping grains with a material capable of forming therewith a hard, wear-resisting

mass and producing irregularly shaped conglomerate bodies thereof for embedding in a cement surface.

10. The process of making anti-slipping aggregate comprising mixing crystalline grains of a hardness of 9 or more with a vitrifiable ceramic material capable of bonding the grains into a hard wear-resisting mass, shaping the same, burning the shapes in a ceramic kiln and producing vitrified masses; and crushing the vitrified masses into aggregates of varying sizes containing a plurality of crystalline grains which form rough, irregular surfaces capable of being anti-slipping.

11. The process of making an anti-slipping tread comprising crushing crystalline alumina into small grains, mixing these grains with vitrifiable ceramic material, forming this mixture into shapes adapted for burning, subjecting the shapes to prolonged heat at a temperature capable of vitrifying the bond, cooling the mass and crushing it to produce fragments each having a plurality of grains therein for embedding in a cement to form a compound conglomerate adapted to serve as a tread surface.

Signed at Worcester, Massachusetts, this 13th day of Feb., 1919.

GEORGE N. JEPSON.