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PAVEMENT

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1 Claim. (Cl. 94—19)

This invention relates to improvements in roads and pavements and more particularly to a novel form of pavement base for highways, walkways or airport runways and the like where a dependable foundation base is required for receiving a desired surface material.

One important object of the present invention is to provide a novel form of roadway pavement base and the method of making the same entirely and solely from materials in natural deposits.

Another object of the invention is to provide a pavement base which shall be made of designated materials obtained from natural deposits and mixed to produce an aggregate which shall possess maximum strength when molded into a pavement.

A further object of the invention is to provide a pavement base of the character designated which shall possess quick setting qualities and be readily adaptable for receiving a seal coating and wearing surface covering of bitumen or other materials.

These and other objects of the invention will be more apparent from the following specification and specifically set forth in the claim.

A pavement base constructed in accordance with the present invention is designed to be of the semi-rigid type and comprises an intimate aqueous mixture of three essential ingredients of earth materials as found in their natural state, namely, oyster shell, coquina, and cumulose soil. One of the important features of the present invention is that these materials are taken from their natural deposits and are not previously treated prior to their mixture into the desired pavement base. A wearing surface of bituminous or other material may be subsequently added if desired.

The oyster shell used in this novel form of pavement base is ordinary commercially dredged oyster shell which normally consists of 80 to 90 per cent of whole shells and 10 to 20 per cent broken shells. This shell is not ground or processed in any manner but is used in the same state and condition as when recovered by dredging or other means, from the original natural beds or deposits. The coquina shell used is ordinary coquina shell as found with sand in natural deposits, which normally consists of about 50 per cent whole coquina shells and 50 per cent broken shells, which have become broken by natural wave and tide action. The broken shells of coquina vary in size from the natural shell to fine particles. This shell is not ground or previously

processed in any manner but is used in the same state and condition as when recovered from the original natural beds or deposits.

The cumulose soil employed is primarily a binder for the oyster shell and coquina and may be in a dry, crumbly condition, or in a damp, wet, or plastic condition. This cumulose soil is sometimes called "muck." Furthermore, it has a high organic constitution in which the vegetable matter has molded and reached an advanced stage of decomposition and is in effect a colloidal mass. The soil is black in color and plastic in form and in its natural state is mixed with earth, as found in natural deposits in low, damp places and swamps. In other words this soil exists in a state such that only a small amount of water is necessary or employed to thoroughly saturate the particles of the cumulose soil, or muck and make it flow to completely fill the voids in the coquina and this mixture of coquina and soil substantially fills the voids in the oyster shell.

When it is desired to form a pavement base, the foregoing ingredients are thoroughly mixed together in any suitable type of mechanical mixer or may be mixed by hand. Water is added to the mixture to thoroughly flux the cumulose soil and produce a resultant mixture of substantially the same consistency as Portland cement concrete used for the formation of pavement bases.

After the base formed from the above mixture has been laid and formed into a pavement base by conventional means, the free water is eliminated by absorption in the subgrade and by evaporation. As soon as the surface of the base reaches the state of dryness prescribed for the various types of wearing surfaces, it is ready for the reception of such wearing surface. The wearing surface may be applied thereon in the same manner as it has heretofore been applied to other forms of pavement bases.

The following are examples of semi-rigid pavement bases formed in accordance with the present invention and illustrating preferred relative proportions of the ingredients. One composition has been found to be very satisfactory where the voids in the oyster shell were about 67 per cent, and the voids in the coquina shell were about 28 per cent, i. e.,

Parts by volume

Cumulose soil or muck	1
Coquina shell	3.4
Oyster shell	4.6

In making up the composition, the operator should determine approximately the percentage of the voids present in the oyster shell, and after determining such voids in the composition, and depending upon the percentage of such voids, using as a constant in determining the proper parts to the composition, the following formula, has been found to be most accurate. For purposes of illustration, taking S as the voids in oyster shells, C as the voids in coquina shells, X as the proportion by volume of coquina in terms of a unit of oyster shell, and Y as the proportion by volume of cumulose soil or muck, in terms of a unit of oyster shell, to-wit:

X equals 1.1 S

Y equals 1.05 C X

Another composition has been successfully used where the voids in oyster shell is 61 per cent and in coquina shell 30 per cent, i. e.

	Parts by volume
Muck -----	1
Coquina shell -----	3.2
Oyster shell -----	4.5

Having thus described the particular ingredients and the method of preparing the same into a pavement base, the several process steps are carried out in the following manner: oyster shells in natural form, whole and parts, coquina shells, whole and in parts including sand of the deposit, and cumulose soil are placed in a mechanical mixer and mixed with water to a proper flowable consistency to form an aggregate which is then applied to a subgrade surface, and confined by forms as is the usual manner of laying concrete. After the materials are thus deposited, the surface is smoothed and agitated by a leveler which is vibrated across the surface. This leveling and vibrating operation smooths the surface and causes the large oyster shells near the surface to lay horizontal and also the voids in the mass to become thoroughly filled and bonded by the actions of the cumulose soil.

One important advantage of such a pavement base is that the aggregate forms a dense, hard monolithic block mass, having a decided advantage over the other known forms of semi-rigid bases. This added advantage of increased strength is obtained by the fact that the whole oyster shells are interlocked and bonded to provide a large bearing surface which is able to distribute the live loads over a greater area of the subgrade upon which the pavement is placed.

A base laid in accordance with the present invention is frequently employed to sustain heavy highway traffic within a period of a few hours after the base is placed. This is of particular

advantage in laying temporary roads, aeroplane runways and other forms of pavements where a quick durable road is required.

When the base is sealed and provided with a wearing surface of mineral fragments commonly used on other bases constructed with natural materials the resultant pavement is permanent in character and far superior in many respects to other semi-rigid pavements now in general use. From the foregoing it will be noted that the roadway may be considered permanent when the base is sealed, and semi-permanent when not protected by a seal covering.

Another advantage of the present invention is that the pavement base is readily adaptable where the factors of cost, time, or the nature of the terrain prohibits proper draining of the subgrade as in the case of temporary roads or those quickly constructed and used as in military operations.

Another important advantage is that the long forming and curing operations usually attendant to road building of this kind, are entirely eliminated with the proposed method because the mixing and placing of the materials is the only operation performed on the materials. In all other known forms of utilizing natural earth materials for road building it has been necessary to roll, grade or treat the materials after placing on the subgrade but in the present case all of this extra work and cost of performing the same is entirely eliminated.

Furthermore, the conservation of the oyster shell is of particular advantage in that a given amount of oyster shell will produce a greatly increased pavement area in place, because the voids in the shell are filled with a cheaper material, and at the same time provide a more durable base due to the interlocking of the shells by the cumulose earth binder.

Having thus fully described a preferred embodiment of my invention it is obvious that various changes may be made therein without departing from the scope of the invention as described in the specification but only as specifically set forth in the appended claim.

What I claim is:

The process of forming a semi-rigid pavement base which consists of providing an aqueous mixture of substantially 4.6 parts by volume of natural deposit of oyster shell, substantially 3.4 parts by volume of natural deposit of coquina and substantially 1 part by volume of cumulose soil, depositing the mixture on a subgrade foundation, leveling the aggregate mixture in situ by vibrating the surface, and sealing the surface with a wearing material.

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