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DRAIN CLEANING COMPOSITIONS

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This invention relates to highly effective drain cleaning compositions and a novel process for preparing these drain cleaning compositions.

Heretofore, mechanical mixtures of various caustic ingredients, such as sodium hydroxide or potassium hydroxide, have been used as drain cleaning compositions, i.e., to free drains from grease and foreign materials. Caustic materials were especially suited for cleaning grease from drains because of their heat producing properties, the high heat melting the grease so that it could be flushed from the drains. Unfortunately, when these caustic materials contact water and other materials in the drain, the exothermic reaction which takes place does not deliver the highest possible temperature in a short enough period of time to avoid the dissipation of heat through conduction via the metal drain pipes and other conductive or convective materials in the drain. This loss of heat occurring when the heat is developed slowly has the result that the temperature is never high enough or maintained long enough to do a complete and efficient job of melting the tenacious grease which plugs the drain and great quantities of cleaning materials or mechanical cleaning means have to be resorted to.

To assist the caustic, various additives, such as aluminum and sodium nitrate, have been added to the caustic or mixture of caustics in an attempt to raise the temperature and maintain the elevated temperature for the longest possible time. Improvements were noted, but left much to be desired. In addition, other problems associated with mechanical mixtures of drain cleaning components were apparent such as the segregation of components during handling, packaging, or shipping and the presence of dust. The segregation of components meant that the mechanical mixture was not uniformly effective and the presence of dust was potentially harmful to the user and wasteful.

The term "mechanical mixture" is defined as a mixture wherein the components are merely placed in a mixing receptacle, mixed together for a period of time, and then used in that state.

An object of this invention is to provide drain cleaning compositions which yield a high temperature and maintain the high temperature for a long enough period of time to clean the drain effectively.

A further object is to provide drain cleaning compositions which do not suffer from the deficiency of segregation and from the dusting problem associated with mechanical mixtures.

Still a further object is to provide a novel process for preparing such drain cleaning compositions.

These and other objects and advantages will become apparent hereinafter.

We have unexpectedly discovered that a composition comprising *compacted* particles composed of an alkali metal hydroxide, an alkali metal nitrate, and aluminum provides a drain cleaning composition which gives an effectively high temperature maintained for a sufficient length of time and overcomes other deficiencies of mechanical mixtures.

The *compacted* particles composed of an alkali metal hydroxide, an alkali metal nitrate, and aluminum are prepared by a novel process comprising the following steps:

(a) Mixing the alkali metal hydroxide, the alkali metal nitrate, and the aluminum, said materials being in particulate form, until a substantially homogeneous mixture is formed:

(b) Compacting the homogeneous mixture under pressure to form a sheet; and

(c) Granulating the sheet.

It is preferred that the following additional steps be included in the process:

(d) Screening the resultant compacted granules to obtain a desired mesh size; and

(e) Recycling the oversized and undersized granules.

Steps (d) and (e) eliminate dusting and efficiently and effectively combine the dust into the homogeneous compacted mixture.

It has been observed that the compacted drain cleaning mixture comprising an alkali metal hydroxide, an alkali metal nitrate, and aluminum attains a high temperature in so short a period of time that the loss of heat through conduction or convection is reduced to a minimum. This has the effect of cutting a layer of grease to optimum levels on initial contact instead of attacking merely the surface and cutting partially through the grease layer.

A more specific mode of preparing the compacted mixture comprises mixing together in substantially dry form, ground or powdered sodium hydroxide (caustic soda), fine or medium granular sodium nitrate, sodium chloride, and aluminum metal for about 6 to about 10 minutes to provide a homogeneous mixture. The mixture is then fed through conventional compacting rolls which are held together under high pressure, about 5000 to about 10,000 pounds per square inch, although pressures of up to 25,000 pounds per square inch can be employed, to produce a hard, compacted sheet product. The compacted sheet is then run through suitable and conventional breaking and granulating rolls and then screened to yield a substantially dust-free product of the desired screen size. Oversized and undersized particles are then recycled.

The aluminum metal can be of a specified particulate form as received from commercial suppliers or in ingot or billet form to be reduced to suitable size before processing. The particulate size of the aluminum particles can range from about −10 to about +60 mesh and is preferably from about −14 to about +30 mesh. The aluminum can be alloyed with copper and/or other metals in varying amounts such as 0.1% to 5.0% alloy metal based on the weight of the aluminum. The bulk density of the aluminum particles, with or without the alloy metal, can be from about 200 to 1250 grams per liter and is preferably from about 230 to about 1150 grams per liter. It was found that the aluminum or aluminum alloy particles remain as discrete particles in the compacted flake whereas the other particulate ingredients do not. It is also contemplated that additional aluminum can be mechanically mixed with the compacted flakes prepared by my novel process; however, the total amount of aluminum present is preferably kept within the range designated below. Such a mixture has also been found to be decidedly more effective than mechanical mixtures.

Coloring materials and/or perfuming substances can be added to the compacted mixture in desired amounts, either before, during, or after processing.

The compacted mixtures can contain about 45% to 70% by weight sodium hydroxide or other alkali metal hydroxide such as potassium hydroxides; about 20% to about 40% by weight sodium nitrate or other alkali metal nitrate; from about 0 to about 20% by weight sodium chloride; and about 2 to about 10% aluminum or aluminum alloy. The preferred compacted mixture contains about 50% to about 60% sodium hydroxide; about 25% to about 35% sodium nitrate; about 10% to 18% sodium chloride; and about 4% to 8% aluminum or aluminum

alloy. Percentages are based on the total weight of the mixture or composition.

The mesh size of the compacted flake is selected by the processor according to his needs, e.g., the requirements of the particular type of drain to be serviced. Typical mesh sizes range from about −2 to about +60 mesh. Within that range lies a mesh size commonly used, i.e., about −6 to about +30 mesh. The explanation of plus and minus designations is set forth below. The particles of alkali metal hydroxide, alkali metal nitrate, and sodium chloride used in preparing the compacted flake are preferably a smaller size than that of the desired compacted flake.

The void space in the compacted flake can be about 2.5% to about 7.5% and is, preferably, about 4% to about 6%.

In addition to its heat producing qualities, the compacted mixture does not segregate under varied conditions of handling, packaging, or shipping and has been found to be substantially dust free. Since each particle of the compacted product is of uniform composition, the product is free of the segregation problem present in mechanically dry-blended products. In these mechanical mixtures, great care must be exercised in choosing the size and shape of the ingredients in order to minimize the segregation or separation of the ingredients during packaging and shipping. The compacted product of this invention, however, is comprised of particles which are homogeneous and uniform in composition and consequently, are not subject to segregation problems. With respect to dusting, in the preferred mode of practicing the present process, dust size particles are screened out and returned to the mixing station where they are fed into the compactor. In the mechanical mixing process, it is uneconomical to screen out dust size particles because there is no way to utilize the dust.

In the following example parts and percentages are by weight. With respect to mesh sizes, the designation of minus means materials passing through the mesh screen of designated size. The designation of plus means material caught on the mesh screen of designated size.

Example 1

Fifty-three percent sodium hydroxide, 28% sodium nitrate, 14% sodium chloride, and 5% aluminum were mixed together in substantially dry form for 10 minutes until a homogeneous mixture was produced. One-half of this mixture was removed and used as the mechanical type of a mixture referred to below. The other half of the mixture was fed through compacting rolls (manufactured by Allis-Chalmers) which were held together under high pressure (5000 to 10,000 pounds per square inch). A hard compacted sheet product from 3/16 inch to 1/4 inch thick was produced thereby. This compacted sheet was then run through breaking and granulating rolls. The resulting granules were screened to yield granules having a mesh size from −10 to +20; and the oversized and undersized particles, including the dust; were recycled through the mixing, compacting, and granulating steps. The absolute density was found to be 2.09 and the void space 5%.

A grease plug was prepared as follows:

A Pyrex glass double strength drainline "P" trap was cleaned by rinsing out the trap with an alkaline detergent. The trap was flushed with hot water; carefully brushed with liquid detergent; flushed with hot water again; and allowed to dry.

Sixty parts of tap water at 10° C. were then added to the trap. The trap was then tilted to 45° and 125 parts of melted Crisco at 110° C. were carefully poured into the trap in such a manner that the grease slowly floated over the water pad with the least amount of mixing or bubbling. The trap was adjusted to the horizontal position and the grease was allowed to set and harden overnight (18 to 20 hours) at room temperature.

A Pyrex extension tube was then attached to the trap by means of a standard drainline clamp. Thirty parts of the product to be tested were poured through the extension tube onto the surface of the grease. Then 237 parts of water at 10° C. were poured over the drain cleaner. The time for plug removal was recorded in minutes and seconds.

In addition to the grease plug removal test, a temperature rise determination was carried out in a Dewar flask using the same proportions of product and water as in the grease plug removal test.

The results are shown in Table I below.

TABLE I

Type of Mixture	Number of Tests (Plug Removal)	Average Time (Plug Removal) in minutes and seconds	Number of Tests (Dewar)	Average Temperature (Dewar) in ° C.
Mechanical	16	(1)	3	67.8
Compacted	16	8:23	3	84.3

[1] Not effective.

We claim:

1. A process for preparing compositions adapted for use as a drain cleaner comprising compacted particles composed of about 45% to about 70% alkali metal hydroxide, about 20% to about 40% by weight alkali metal nitrate, aluminum, and 0 to about 20% by weight sodium chloride comprising the following steps:
   (a) mixing the alkali metal hydroxide, the alkali metal nitrate, the aluminum, and the sodium chloride in the absence of external heating said materials being in substantially dry particulate form, until a substantially homogeneous mixture is formed;
   (b) compacting the homogeneous mixture under pressure to form a sheet; and
   (c) granulating the sheet to form compacted particles.

2. A process for preparing compositions adapted for use as a drain cleaner comprising compacted particles composed of about 45% to about 70% alkali metal hydroxide, about 20% to about 40% by weight alkali metal nitrate, about 2% to about 10% by weight aluminum, and 0 to about 20% by weight sodium chloride comprising the following steps:
   (a) mixing the alkali metal hydroxide, the alkali metal nitrate, the aluminum, and the sodium chloride in the absence of external heating, said materials being in substantially dry particulate form, until a substantially homogeneous mixture is formed;
   (b) compacting the homogeneous mixture under pressure to form a sheet;
   (c) granulating the sheet to form compacted particles;
   (d) screening the resultant compacted particles to obtain a desired mesh size; and
   (e) recycling the oversized and undersized particles.

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CERTIFICATE OF CORRECTION

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It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 35, strike out "breaking"; column 4, line 32, for "nitrate, aluminum, and 0 to about 20% by weight sodium" read -- nitrate, about 2% to about 10% by weight aluminum, and 0 to about 20% by weight sodium --.

Signed and sealed this 26th day of November 1968.

(SEAL)
Attest:

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