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Sparks

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[54] PROCESS FOR MANUFACTURE OF A GRIP FOR HAND-POWERED EQUIPMENT

[72] Inventor: **William J. Sparks,** 5129 Granada Blvd., Coral Gables, Fla. 33146

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Primary Examiner—John F. Campbell
Assistant Examiner—Victor A. DiPalma
Attorney—Meredith P. Sparks

[57] **ABSTRACT**

This disclosure relates to a process for manufacture of grips for hand-powered equipment in which an assortment of grips are manufactured, each having a hardness within the range of that of the human hand. The hardness profile of the hand contact area of an individual operator who is to use the grip is measured, and a grip is selected, the hardness of which is correlated with the hardness of the hand contact area of the individual. This grip is installed on the hand-powered equipment for the use of that individual.

10 Claims, No Drawings

PROCESS FOR MANUFACTURE OF A GRIP FOR HAND-POWERED EQUIPMENT

This invention relates to a process for manufacture of a grip for hand-powered equipment. More particularly, this invention relates to the manufacture of a grip in which a shaft portion is covered by a superimposed layer of a sponge elastomer.

A most important physical contact between man and the outside world is through the human hand. The application of force through the hand is manual. The relation between the hand and the force-accepting structure is tactile. Within a narrow range of surface layer hardness, both the hand and said layer are deformed on contact. Since surfaces are characterized by rugosity, a change in surface due to manual distortion is tactile rugosity. It is this phenomenon of tactile rugosity which gives rise to "feel." Feel is the sensitivity factor through which individuals vary greatly in manual dexterity. Feel, which is so important in arts, crafts and sports, is therefore a matching of the force-transmitting layers of the hands with force-accepting layers of outside objects. The almost universally accepted shaking of hands is a force-transmitting, force-accepting routine which, because of "feel," many times has critical effect on relations between individuals.

It has been recognized that hand sensitively for hard steel as compared with soft iron is very poor, whereas the hands are very sensitive to "touch" with other parts of the body, etc. There is then an upper range of maximum manual and tactile sensitivity. Using the Shore A Hardness test, the optimum hardness from a force accepting standpoint is below 50 Shore A Hardness. It is interesting that these considerations have been generally absent in the design of hand-surface contacts. This is especially true since we have determined experimentally that all individuals like the "feel" of an outside deformable layer when it has a hardness of 15 to 50.

However, not all individuals are alike in their hardness sensitivity throughout this range. There are two other very interesting considerations, namely (1) human hands also vary in hardness in the same hardness range as the preferred hand contact layers, and (2) that there is a selective relationship between the hardness of any one individual's hand surface properties and the preferred properties of a contacted surface.

It is well known that when a harder surface moves against a softer surface, the softer surface receives the abrasion. For example, in the design of a broom handle, wood operating against the hand under conditions favorable to torsion would be undesirable. Advances in modern technology have produced hard varnishes which are currently used on broom handles to make them slicker and harder, with no regard to the housewife's delicate hands and increasingly fragile temper. Of course, this applies to hoes, rakes, axe handles, billy clubs, tennis racquets, golf grips, etc. The point is that a force-receiving surface layer of a tool grip needs to be compatible with the force-applying hand layer, and that this compatibility is individual. Moreover, for different tools, the compatibility needs to be relative to specific hand contact areas. For example, a guitar player might have a hardness of 45 Shore at the tip of his playing finger and a hardness of 25 Shore in relation to holding an automobile steering wheel.

These are important in the new science of tactile rugosity. Of course, the science itself could not have developed without the intensive experimental observations of the nature of hand force applications through the hard surface, and the nature of hand power receiving layers contacting the hands. However, in order for this knowledge to be made useful to mankind in his contact with the inanimate world, a usable relationship for different individuals must be devised.

We have discovered that there is a measurable relationship between variations in individual hand force transmission properties and the properties of the force acceptor so that the manufacturer of parts for hand-powered equipment can (1) supply for each type of force-accepting layer a range of properties compatible with the needs of individual force-applying hand surface layers in contact therewith, and (2) provide a method of measurement, balancing the properties of the manual powering hand surface with the properties of the force-receiving layer, vicinal to the hand surface layer.

Hardness is commonly expressed in Shore A durometer hardness units. Shore hardness is determined with the Shore A durometer in which a pointer is forced into the test specimen. A score from 0 to 100 units reflects the hardness, the higher readings indicating harder compounds. The preferred instrument for use in my invention is Shore Durometer Hardness Type A–2 (0–60) ASTM D2240 manufactured by the Shore Instrument & Mfg. Co., Inc., Jamaica N.Y. Using a Shore hardness meter the desired hardness lies in the range from about 15 to about 50. This invention is not limited to reading on a Shore A durometer instrument, but includes the use of any other hardness-measuring instrument capable of giving comparable reading.

The hand grips provided by this invention are particularly useful for clubs, racquets and the like used in various sports and games, such as tennis, field hockey, ice hockey, lacrosse, squash, fishing poles and the like. An especially preferred embodiment of our invention is in grips for golf clubs. The grip is particularly useful for sporting implements whenever it is desirable that a hand grip be securely grasped and held, and when the impact of the ball with a club or racquet is with sufficient force that it may cause blisters or callouses on the hand.

The novel grip is also useful for incorporation in hand tools such as a hatchet, hammer, policeman's billy club, or the like, which are similarly used to transmit power through a shaft to a head that is used to strike an object, or in equipment such as automobile steering wheels, or walking canes. The novel grip results in greater precision, less energy loss, and reduced shock at the time of impact. It also reduces injury to the hand. Grips of this type are described in copending application Ser. No. 773,689, filed Sept. 25, 1968, Grip for Hand-Powered Clubs.

Foamed sponge elastomer for making the grip is prepared in several ways, as is known in the art. The process in general use consists of beating the thickened latex into a foam. The proper coagulation of the latex so as to give a suitable foam is the key to the successful application. An alternative process calls for the use of a vacuum to cause the generation of gas in the latex. The resulting foam is stabilized by the presence of certain chemicals or by other means.

One method for making such grips is given in the following example:

EXAMPLE 1

Mill GRS rubber (900 g.) on a rubber mill until soft. Then add the following ingredients: silica pigment (300 g. of Silene D); petroleum oil (100 g. of 42x Circisol); zinc oxide (50 g.); antioxidant (20 g.); and titanium dioxide (90 g.).

To a 300 g. portion of the above product on a rubber mill add the following ingredients: a rubber accelerator (Trimene base 1.8 g.); sulfur, 3.6 g., Tetramethylthiuram sulfide (Monex 0.6 g.) and an azide blowing agent (Unicel 2.5 g.).

Cure the mixture for about 15 minutes at about 143° C.

When a ball is hit with a golf club, due to the shape of the club head, the ball is struck at a point offset from the handle or shaft axis. This results in an undesirable twisting of the club in the hand, regardless of the type of hand grip that is on the shaft of the club. If the outermost surface of the grip next to the hand is harder than the hand, the twisting will injure the hand, and callouses will form. Using clubs with the grips now on the market, even the best golf professionals have thick callouses on their hands where they have grasped the club. The ordinary player will come home from an occasional game with sore hands; the arthritic golfer may not be able to play at all due to the shock at his finger joints. For so long as the contact surface grasped by the hand is hard, the player's hand will be injured whenever the hard surface of the club grip twists in his hand. The applicant has provided a grip where the surface grasped by the hand has approximately the same Shore hardness as the hand itself. Moreover, it can be tailored to approxi-

mately the hardness of the hands of a particular player. Abrasion will not occur between two surfaces having approximately the same hardness and cushioning effect. Thus, any twisting of the club due to an offcenter blow will abrade, not the hand, but the interface between the soft grip and the steel shaft. If the grip wears out, it is disposable and easily replaced with another one.

Various methods have been devised to reduce the twisting, for example, by wearing a glove, but this introduces two extra surfaces without providing a cushion between the grip and the shaft. The applicant solves the problem, not by trying to stop the twisting, which studies show to be impossible, but to prevent abrasion and damage to the hand when twisting occurs. Thus the golfer will not lose the "feel" so important to all professional golfers.

The applicant has discovered that when the hand-club interface is made of a sponge elastomer having a Shore A hardness within the range of from about 15 to about 50, the player will not come home from a game of golf with sore hands, and will not develop callouses. The applicant has also found that individuals differ in the optimum hardness properties due to the difference in the Shore A hardness of their hands. Pressing the gauge of the Shore A hardness-testing instrument against the hand itself, the Shore A hardness of the hand contact area with a tool or club will read in the range of from about 25 to about 40. By manufacturing grips throughout this range, some would be ideal for some one. But not all degrees of hardness would be optimum for everyone. That is to say the most desirable hardness of the grip is in fact the hardness profile of the hand contact area of the hand of the individual using the grip. The most satisfactory hardness of the grip can be determined by measuring the hardness of the hand contact area and then producing a grip having the properly related hardness, or producing an assortment of grips having within the desired range and selecting therefrom the most suitable grip and installing this grip on the equipment.

In summary, my invention describes a process for manufacture of a grip for hand-powered equipment which comprises the following steps, which may be carried out in any order:

a. manufacturing an assortment of grips for said equipment, each having a hardness within the range of that of the human hand;

b. measuring the hardness profile of the hand contact area of an individual operator who will use the equipment;

c. selecting a grip which has a hardness that is correlated with the hardness of the hand contact area of said individual; and

d. installing said grip on said hand-powered equipment.

I claim:

1. A process for manufacture of a grip for hand-powered equipment which comprises the following steps:

a. manufacturing an assortment of grips for said equipment, each having a hardness within the range of that of the human hand;

b. measuring the hardness profile of the hand contact area of an individual operator who will use the equipment;

c. selecting a grip which has a hardness that is in the range of the hardness of the hand contact area of said individual; and

d. installing said grip on said hand-powered equipment.

2. The process of claim **1** wherein hardness is measured with a Shore A durometer.

3. The process of claim **2** wherein the hardness is within the range from 15 to about 50 Shore A durometer units.

4. The process of claim **3** wherein said grip is prepared from a sponge elastomer.

5. The process of claim **4** wherein said sponge is prepared by regulating the amount of blowing agent used in the production thereof.

6. The process of claim **4** wherein said sponge properties are obtained by a closed cell sponge resulting from evolution of a gas within the grip mass as a part of the final curing operation.

7. The process of claim **1** wherein said grip is for a golf club.

8. The process of claim **1** wherein said grip is for a racquet used for games.

9. The process of claim **1** wherein said grip is for an automobile steering wheel.

10. The process of claim **1** wherein said grip is for a garden instrument.

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