UTILITY FOOD GRATER
Invented by Michael Tyler Richardson
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(Drawings on last page)

The invention to be discussed was the thought of Mike while preparing a typical dinner one evening. I, Mike had noted that grating cheese for a casserole was not always an easy task, holding and using either of my two graters, one being a flat panel type and the other a box style was always uncomfortable unless they were resting on the counter. This was also the case while using a box grater to scallop potatoes into a bowl. One may ask, why not just set these graters on the counter, and do the work. My reasoning would be wasted time, energy, and material. By holding the graters above the area to receive the grated product, one eliminates the need to use a second plate, cutting board or other collection base to receive the grated material. This collector would have to be washed when finished or if one used a paper towel it would be thrown away. It is also inconvenient to have to grate and then transfer the grated material into or onto the dish being made. Doing so with cheese can be difficult as cheese tends to bunch up and it then requires separation and spreading if dressing the surface of a dish. Grating directly to the dish being prepared allows more uniform distribution. While scalloping potatoes with a box style grater I was required to hold the box from the bottom, ignoring the top handle so I could support the box and grate the potatoes into my bowl. When using this style on the counter not only was transferring the potatoes required but I also had to lift the grater very frequently to remove the grated potatoes that filled the boxed in area. This is an added inconvenience when grating five to ten potatoes at one time. I had shared my experiences with my wife and she agreed that she rarely used the panel style grater due to the discomfort it gave her while trying to hold the extended handle from the top and grate on it's face.

So, why are these graters uncomfortable? It would appear that over the past one hundred years or so, according to my patent searches, that there are basically three styles of graters. There is the flat panel style with a rectangular panel of grating area and a handle attached to the top of the unit extending upward for holding by the operator. These are typically used to grate above a bowl or other area for the distribution of grated material as explained above but more often are rested on a work surface. There is the box style with typically three or four sides of different grater cutting surfaces, again having a handle or knob extending from the top as a

holding mechanism. These can be used suspended above a bowl but normally are used on a work surface such as the counter, a plate or cutting board. There is also the mechanical style grater, these graters typically have a means of driving drum type mechanisms that grate material, as it is pressed against the drum or disc. These types are fairly difficult and time consuming to clean, as there are a lot of moving parts that need a good washing when finished. There are basic reasons why the plate and the box graters are uncomfortable; the mechanical style I have not used but probably would not due to the amount of cleaning required unless I were in the food preparation business. The main reason for the discomfort lies in the basic design of the plate and box style graters, a design that has been around for a long time. The mechanics relating to the function of forces applied to the operator's hand must not have been considered in those early times and a precedent was set for their look and not their ergonomics. The mechanics are basic in that when a chunk of cheese or a potato is pressed against the grating surface a force is developed. The amount of this force is in proportion to the amount needed to have the grater cutters do the work. Not only is there longitudinal force but there is also vertical and tortional force. As the operator pushes the material against the surface, load is applied not only to the surface of the panel but also to the handle being held by the operator. With the handle, being located at the top of the grater the mechanics of a lever are induced. The applied force becomes stronger as the operator moves the material being grated toward the bottom of the panel surface. This can become a factor of ten to one as the force on the bottom of the panel also has become tort ional force on the operator's hand, wrist, and arm. This force tries to rotate the wrist with a fair amount of power. As this is being done the force is also placed at the bottom of the hand where the palm below the baby finger meets the handle, this point is now a fulcrum and a lever is developed attempting to force the top of the handle away from the operators grip, forcing the fingers to open. These two basic forces make holding a grater by the top handle for suspended grating as supplied by all grater manufacture's we have found world wide uncomfortable. Operators must overcome the tendencies to have their wrists, hands and arms rotated and their fingers pried open along with the expected and anticipated force needed to push toward the material being grated with the arm to perform the work. Another way the conventional grater is used is with the handle held horizontally with the panel extending away from the operator. The material to be grated is slid away from the operator while forcing downward on the panel. The forces while using this method increase as the material moves further out towards the end of the panel and requires the operator to constantly compensate for the

changing loads while moving the material from one end to the other. These forces are also amplified by the distance away from the grater handle as determined by the location of the material at its surface. These forces also induce a rotational torque on the elbow and the rotator muscle in the shoulder as well as a force of bending at the wrist.

My new grater design is based around four basic principles. They are, 1) Ease of operator use through good ergonomic design, 2) Simplicity to manufacture, as in the ability to utilize much of the existing tooling currently in place by grater manufacturers with it's single handle. 3) Simplicity of a three piece design that will provide a very inexpensive device for all income levels, and 4) The simple three-piece design with a single attaching point makes cleaning very easy, allowing a sponge freedom to move along the back side of the panel. This simplicity also reduces areas that can trap food and cause bacteria growth.

My design is best shown in the photos attached and as referenced to in this description. It is basically a plate type grater with the handle attached through a continuous loop of steel rod wrapped around the unit and exiting at the top much as in the same way as a conventional panel grater found in most stores. Where we differ is in what we do with the handle. We have brought the handle down to the backside of the grater panel and have established a bend from the top of the plate entering into the handle, placing the loop in compression at the junction, and distributing tortional force throughout the top of the loop at the plate and down the sides. There is clearance for the handle from the backside of the panel for grated material to fall freely. An angle has been established in the handle so as to have the grater handle be at an angle at such a length as to have it rest on a surface, like a counter top or cutting board at an angle for the purpose of grating. This handle is molded in an ergonomically fashion to accept a variety of hand styles and sizes and will accommodate both right and left-handed operators. At the base of the handle the plastic material flares outward on the sides approximately two inches and conforms to the natural shape of most hands in the area on the side of the baby finger. The bottom of this flared area is shaped to rest flat on a working surface at the predetermined angle and reduces side-to-side rocking when the grater is used on a counter top or such.
The functionality and the forces induced by our grater design are very simple and are as follows. With the grater handle coming down the backside of the grater it now becomes located on a more direct plane and the center of work when the work

and forces induced by grating are present. The forces on the hand, wrist, and forearm are now mostly in compression by the force of the material being pressed toward the surface of the panel. These forces are much more tolerated by the operator and are natural like pressing ones hands together. There is, however, still the rotational force being induced on the rotator muscle in the shoulder. Of course this muscle is much larger than the other hand, wrist and arm muscles doing most of the work with the conventional grater. In both cases, the shoulder muscle takes the final loads of the operation of grating but with our design there is a larger amount of the load being transferred directly to this muscle than through the others.

The bottom line is that grating takes energy, and forces are generated while doing so. What we have attempted to do is have these forces absorbed by muscles in the body that are more apt to dissipate the loads more uniformly and on larger surface areas of muscle than with the conventional style graters.

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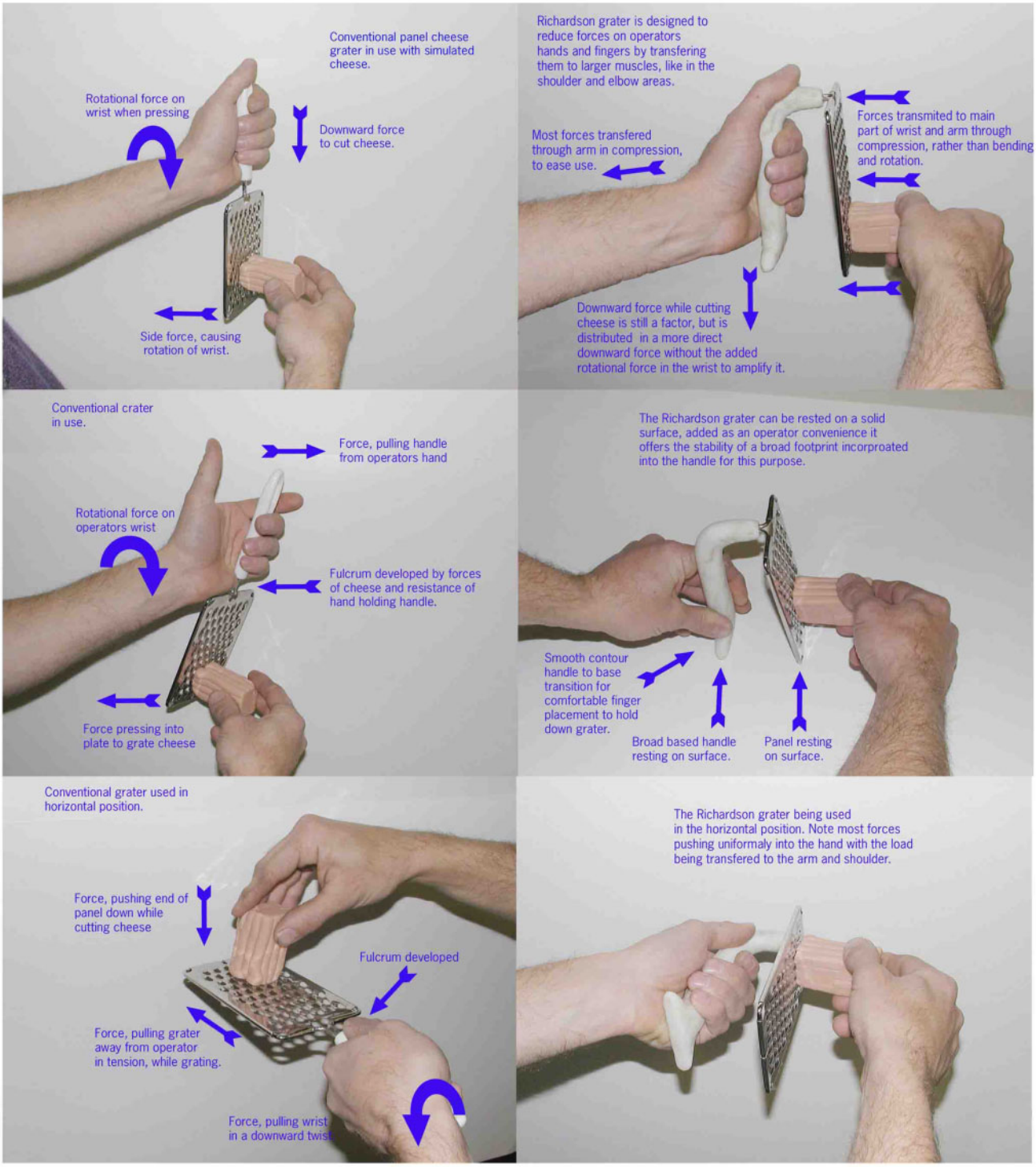
The following pictures are of a handle model only using an off the shelf store bought panel. There are an endless number of handle possibilities that may be used for a unique design by any manufacture wishing to license rights to the concept.

Michael



CONVENTIONAL PANEL GRATER

RICHARDSON PANEL GRATER