

BY TIM HEALEY

From Bra Cups to PPE

Sixty years ago, the first lightweight, disposable dust masks were developed by 3M. These early versions would lay the groundwork for the modern, single-use N95 respirators used today (prior to the N95, respirators resembled WWI gas masks; they were uncomfortable to wear and needed to be rinsed before being re-used). While the benefits of lightweight, maintenance-free PPE are clear, the origin story of how they came about is less so.

Starting in the late 1930s, 3M began work on a new line of products known as “nonwovens” while searching for an inexpensive, noncorrosive backing for electrical tape. Nonwovens are composed of synthetic fibers bound together via heat and pressure without weaving. Following unsuccessful attempts to produce a quality tape backing, 3M pivoted to marketing nonwovens as decorative ribbons for gift wrapping in the mid-1940s. By the late 1950s, it had developed molded nonwoven technology to stiffen ribbons and bows, which opened the door to making other three-dimensional shapes.

Competing epiphanies. The transition from molded nonwoven ribbon to respiratory PPE is a little fuzzier. One version of events involves Sara Little Turnbull, a well-known product designer and former décor editor for *House Beautiful* magazine. In 1958, Turnbull reportedly began consulting with 3M’s gift-wrap division. Excited

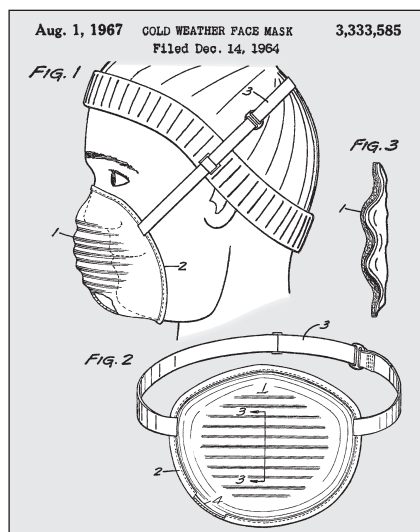
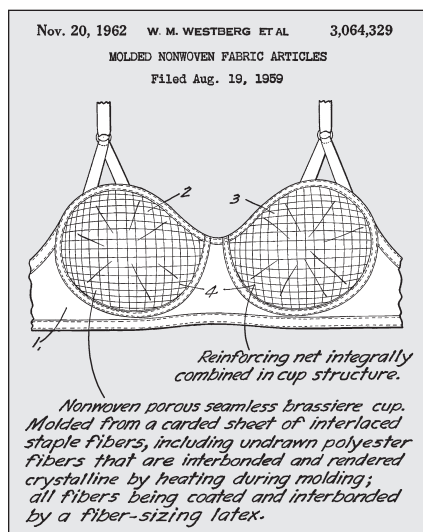
by the molded nonwoven technology, she recommended 3M pursue new applications for nonwovens, presenting more than 100 new product ideas, one of which was a molded brassiere.

Turnbull’s PPE epiphany apparently occurred while visiting sick family in a hospital. A keen observer, she noticed hospital staff fidgeting with their cloth face masks and got the idea for a new product based on the molded bra—a “bubble” surgical mask. The bubble mask was introduced in 1961, but it had to be re-branded as a “dust” mask because it couldn’t block pathogens.

An alternative “aha” moment involved a 3M scientist, Pat Carey. According to *A Century of Innovation: The 3M Story* (3M, 2002), Carey noticed a display of Halloween masks as he walked through a local store and got a bright idea. Excited, he apparently rushed back to the lab and made a prototype out of nonwoven material and asked his co-workers to “try breathing through it.” This quick demonstration led to applying nonwoven technology to the development of maintenance-free respirators and surgical masks.

Regardless of whose brainchild it was, the N95 respirator has become essential to the construction and health-care industries.

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This 1962 3M patent (left) notes the brassiere as the principal product for “molded nonwoven fabric articles,” as well as applications such as “porous breath-filtering face masks used by surgeons ... and industrial workers.” An early bra-like, PPE relative is the “cold weather face mask” shown here in a 1967 3M patent drawing (center). A modern N95 respirator (right).

Left and center: Images courtesy the US Patent Office. Right: Adobe Stock/Felipe Sanchez