

Marketing Dust: The Effect of Packaging Technology on the Marketing of Cement and Carbon Black

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This case shows how a packaging innovation can be prompted by a growing demand for a commodity with technical packaging problems, and how the innovation diffuses to market other commodities with similar problems.

The case study deals with the innovation of multiwall paper sacks in the 1930s to market portland cement and carbon black. The American demand for both had been growing since 1880 due to improvements in technology and the growth of printing, transportation and construction. Both faced similar packaging technology problems due to their dusty nature. The dust is hazardous to breathe, and the production, handling and warehousing sites posed a significant health risk to workers employed in the marketing channels.

Cement: From Barrels to Textile Bags

The “magic” process of portland cement manufacturing was imported from Germany in 1878 and improved by the American invention of a continuous process and coal power. Portland cement replaced less-reliable natural cement as the powdery binder for concrete that built the canals, roads, dams, foundations, and architecture of America. During the period 1890-1900, cement shipments tripled.

Prior to the 1880s, cement was packed in wooden barrels and most mills had their own cooperage. As it grew, the industry turned to reusable textile sacks, which were more suitable for railroad transport (American Cement Company, 1895). The use of textile bags grew after Union Special, in 1880, developed rapid sewing machines for the textile bag industry (Union Special Co., 1903). Long after all cement was sold in bags, prices and even census quantities were expressed in terms of 376-lb barrels, and the standard bag was $\frac{1}{4}$ barrel, 94 lbs.

Men filled the sacks with shovels, weighed, and tied them closed in “a tedious and inefficient process.” Reuse added to the dust, forcing mills to add cleaning and repair stations. Deposit/repurchase policies resulted in “vexatious” battles between producers, customers and railroads, and “the sack question” became the primary catalyst for the industry to organize the Portland Cement Association in 1902 (Lesley, Bartlett et al., 1924).

The Valve-Style Textile Bag Solution

The valve-bag concept, patented by “salt seller” Adelmarr M. Bates in 1898, was the first solution. He first added a self-closing “comparatively small filling-aperture” in one corner of a textile bag (Figure 1). The opening “will automatically close under the pressure of the contents when the funnel is withdrawn, and thus prevent leakage with a resistance increasing in direct ratio to the pressure of the contents thereagainst” (Bates, 1903, p. 2). He patented a machine to weigh the bag as it was filled, and established the Bates Valve Bag Co in 1901 to sell machines and license the package design.

Bates realized the package’s uses beyond salt, and next targeted the larger markets for dusty cement, plaster and lime. The valve filling process was cleaner than filling an open-mouth bag, since the dust is trapped and entrained air is evacuated through the porous sack weave. The first cement installations were in 1904, and by 1913 he had ninety-five license agreements for four-spout machines that could fill 4,000 bags in ten hours (Hoppe, 1942).

The Bates bag and filling machine sped up the filling process, replaced labor, reduced dust, and offered marketing advantages: dependable weight, secure closure and easier assessment of quality. One of the greatest advantages was the “ease with which samples may be drawn” through the valve,

since it was customary for purchasers to test cement (Meade, 1926, p. 541). But the reusable “sack problem” persisted.

Adaption and Diffusion: Multiwall Paper Valve Bags

Disposable paper bags were the solution. Single-ply paper shipping sacks with tied or sewn ends had been first developed for flour during the US Civil War when the Southern supply of cotton was disrupted. The first American paper shipping sack manufacturer was Arkell & Smiths, which held several early patents for pasted satchel-bottom bags that were tied closed (Arkell & Smiths, 1949).

In 1905 Bates and John Cornell patented a paper valve bag and modified their machine to fill rock products into a single-wall bag made from strong, thick manila paper. But it was not strong enough for the standard 94 lbs. of cement. The search for a stronger paper bag led to the multiwall concept. Bates and Cornell invented a multiwall gusseted valve bag, filing a number of patents beginning in 1924. The bag ends were sewn and reinforced with tape, a notch was cut for the valve, and the valves were inserted (Hoppe, 1942).

Never was a new product more enthusiastically received by the cement industry.... Its performance brought about a much broader use of heavy-duty multiwall paper bags (St. Regis Paper Company, 1958).

The bag walls were eventually made from strong kraft paper, made by the pulping process developed in the 1920s that took advantage of the long fibers in softwood.

Other licensees followed, including the largest of the existing paper bag companies (Edgar, 1926; Arkell & Smiths, 1949). Bates created an international company to handle the foreign licensees in 1924, and in 1929 won a patent infringement lawsuit against six German bag manufacturers (Steinecker, 2004). Production rose astronomically, from 18 million in 1923 to 133 million in 1928 (St. Regis Paper Company, 1958).

The cement industry embraced the new Bates multiwall paper bag, made from 5-6 layers of strong water-proof paper with sewn ends.

This makes a strong, serviceable package. These bags are of course not returnable, but as there is always a considerable loss in handling cotton sacks, the cement packed in these bags probably costs the user no more than when packed in returnable cotton bags (Meade, 1926, p. 391).

The outer paper ply added marketing opportunities for better brand identity. Paper is easier to print, has better graphics capability and a cleaner overall look than textile (especially dusty reused) bags.

Shortly after Bates' death, his companies were acquired by St. Regis Paper Company, which became a leader in multiwall bag technology. St. Regis pioneered the stepped end pasted valve bag in the US after WWII, which resulted in an extremely tight, sift-proof bag (Figure 2). They improved force-flow filling equipment and automated both ends of the cement packing line, with automatic bag applicators, check-weighers and palletizers. They acquired kraft paper mills, competitors, new technology, and expanded the multiwall bag market (St. Regis Paper Company, 1958).

Multiwall Valve Bags for Carbon Black

Compared to cement's dustiness, carbon black is worse. The communities surrounding production sites were notoriously shrouded in “darkened plumes visible for miles, soot blanketed countrysides and blackened farm animals” (Drogin, 1968).

Carbon black is a fine black pigment that was developed to print halftones in the 1880s. Along with the increasing supply of machine-made paper, it helped to fuel a printing revolution (which, in turn, fueled the growth of modern marketing media like advertisements and packages). The industry's greatest growth was after 1915, when carbon black was found to be a good reinforcing agent for rubber tires. This new demand “dwarfed” the earlier use for coloring (Cohn, 1998).

The channel process made a light fluffy powder which was bagged and then the bag was compressed and packed in a second bag (Drogin, 1945). It was too dusty to pack in a cement bag. “The stuff was ordinarily hell to handle” (Bull, 1996, p. 180). Open mouth paper sacks, closed with twisted wire, were considered state of the art compared to the previous method of using paper-lined wooden boxes (Columbia Carbon Company, 1955).

Bancroft Bag specialized in supplying the carbon black industry, locating its 1924 multiwall plant in West Monroe, Louisiana to take advantage of a new southern kraft paper mill and proximity to 95% of the nation's carbon black industry. Bancroft developed a double-wall, open-mouth square-bottom bag that sifted less and could be used for export, and by 1959 it announced a "major step forward" for the carbon black industry: a gusseted, pasted, valve bag that was packed under vacuum, strong and sift-proof with "perfect" squared-off ends (Bancroft, 1984). Over the same period, the carbon black industry developed better production methods to reduce the dust and enable it to be shipped in bulk (Drogin, 1945).

The industry became cleaner and so did the packages, although workers were still exposed to dust during packing, stacking, loading and unloading (National Institute for Occupational Safety and Health, 1978). By 1968, 30% of output was packed in 50-lb multiwall valve sacks, which were by then being vacuum-packed in a hermetically sealed filling machine (Drogin, 1968).

Conclusion

This case study shows how a meteoric rise in demand for a product inspires an industry to find more economical and technically optimal packaging solutions. It illustrates how suppliers influence the adoption of business-to-business innovations (Frambach, 1993).

In addition to being a marketing success, the multiwall valve bag improved worker safety: "Cement, grain and flour dusts had long plagued workers with respiratory illnesses, often causing premature death. The invention and acceptance of the Bates multiwall valve bag was a safety breakthrough that has received less recognition than it deserves" (Amigo, 1980, p. 98).

Beginning with the Bates innovation for cement in 1927, the multiwall paper shipping sack came to dominate markets for granular products throughout the rest of the century. Improvements in the marketing and branding of sugar, flour, minerals and chemicals were enabled by developments in the paper sack industry. By 1980, multiwall paper shipping sacks were being produced in all of the world's industrialized countries, even if they had to import the strong kraft paper (Stiles, 1983).

The multiwall bag industry may be nearing the end of its life cycle. In the past 100 years, there have been many manufacturers and individuals who have contributed to its history (Drasner, 2007; Steinecker, n.d.). But in the past twenty years the industry has contracted and consolidated to the point that almost none of the old names remain. For example, the St. Regis bag division has been sold four times; the US industry output peaked in 1999 (Impact Marketing Consultants Inc, 2006), and output has been falling steadily as paper bags have been increasingly replaced by substitutes like plastic bags, intermediate bulk containers and bulk shipping.

But for dusty cement and carbon black, whose early market growth depended on them, multiwall paper valve bags are still used. [1]

Note

[1] This investigation is the first in a larger project that aims to discover how developments in shipping sack technology have affected the history of marketing granular commodities. The CHARM presentation will end with a vision of the larger project that begins with Ancient Egyptian grain shipments to Rome (were they in sacks or not?), includes Calcutta jute (what was its role in the expansion of the British Empire?), extends the US cotton and kraft paper investigation in this abstract, and ends with plastic sacks used today.

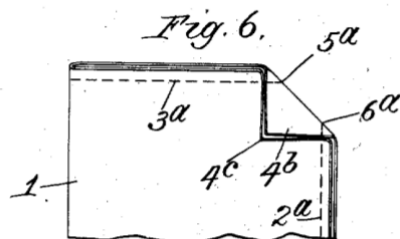
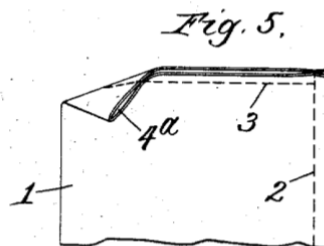
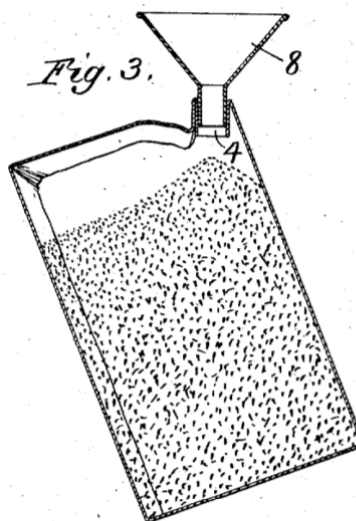
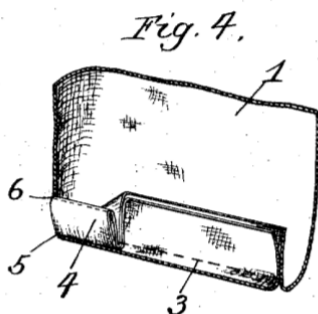
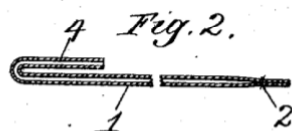
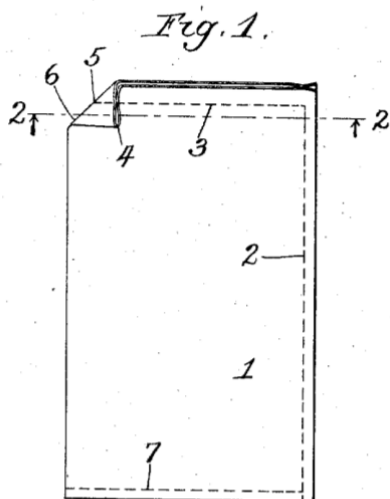
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A. M. BATES.
SACK, BAG, OR OTHER FLEXIBLE RECEPTACLE.

(Application filed Nov. 18, 1902.)



Witnesses.

Edwrd. T. Wray-
Houder Craft

Inventor.

A. M. Bates,
by Carter K. K. K.
Attorney's.

Figure 1: Bates' original valve bag design

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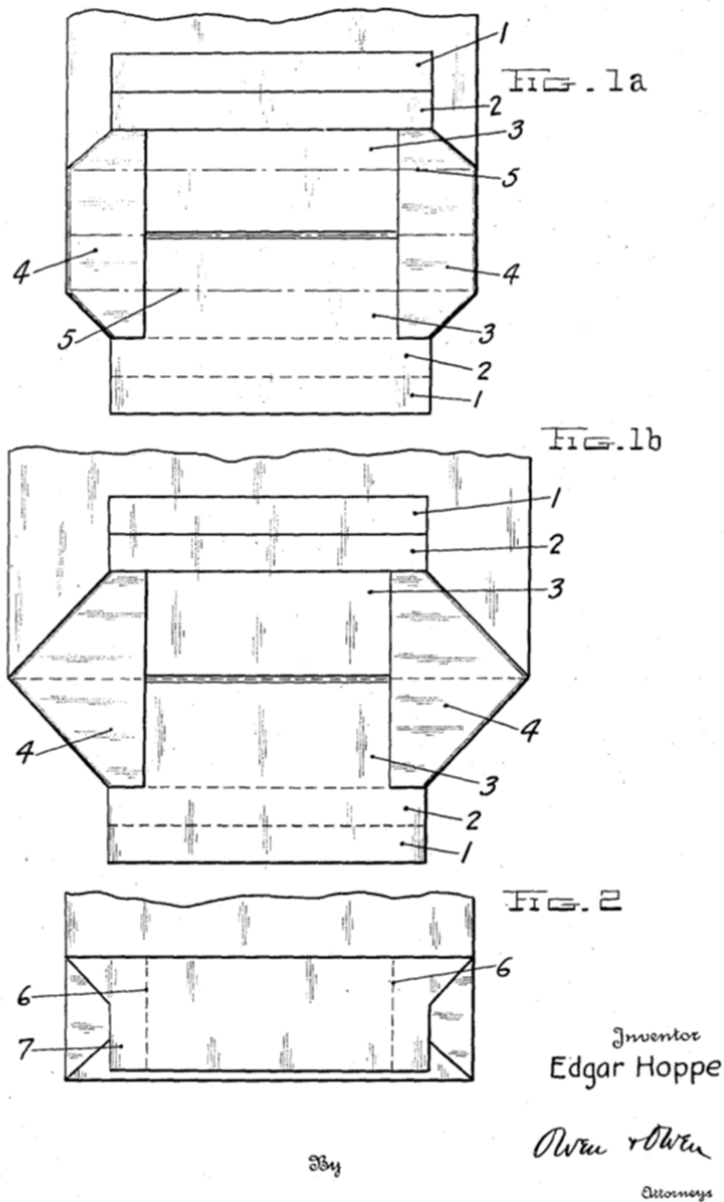


Figure 2: Stepped end multiwall bag