

## Chapter 6

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## Composition of Matter Claims—Chemical Cases

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### 6.1 In General

Compositions of matter are products where the chemical nature of the substances or materials used, rather than the shape or form of a product, is the distinguishing characteristic. As with machines versus manufactures, there is no need to determine the statutory pigeonhole between manufacture and composition. If one had a situation where both the form and composition of a material were required for novelty, or otherwise to be claimed, it would not be necessary to designate into which class the claim fell.

As in the other classes, most composition claims are combination claims, except where a new compound or molecule per se is claimed. Even those involve combinations of the chemical elements, and groups of elements, or radicals. Composition claims are usually fairly easy to prepare, as to formulating a claim; the main problems relate to the allowable scope of the claims, such as: How many examples are

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needed to support a generic claim? <sup>1</sup> How close can one come to the prior art? Problems in broad functional definitions of materials (section 3:24) are especially acute. <sup>2</sup>

One simple example of a composition claim to a combination of materials follows:

**11. A zinc electroplating solution, comprising:**

- (a) **an aqueous solution of zinc acetate, from 30 to 90 grams per liter;**
- (b) **citric acid, from 1.5 to 3 times the zinc acetate concentration; and**
- (c) **an alkaline pH-modifying substance in an amount sufficient to adjust the pH <sup>3</sup> to a value of from 4 to 5.5.**

Note that the “elements” of a composition claim are chemical elements or compounds, described either broadly (element c) or narrowly (elements a and b), depending on the prior art. Note that the “pH modifying substance” clause is very similar to a “means clause” in that it tells what function the element performs, not what it is. Presumably, any alkaline substance would work in the combination, and the point of invention concerned establishing the stated pH range, not how to establish it. Means clauses are not often if ever used in composition claims, but the author sees no theoretical reason why they could not be, as: “means for adjusting the pH of the solution to a value of from 4 to 5.5” or perhaps “a substance for . . .” because it is not necessary to use only the word “means” to meet 35 U.S.C. § 112(f), (section 3:29). As described in section 3:29, the statute says “an element in a claim for a combination”; it does not limit this to any particular type of combination.

In a composition claim, it is usually not essential to state the intended use for the composition in the preamble. Under classic rulings, a label such as “zinc electroplating solution” will not save the claim if the composition per se is old for another use. (See further comments in

section 6:7, new use claims.)

A composition of matter, claimable under the patent law, may be a new molecule, compound, solution, mixture, and even a living being, etc.,

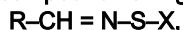
although, in the case of a mere physical mixture of materials, an obviousness question is very likely to be raised. However, the test should be whether it would have been obvious to associate the materials, not *how* they are associated. *Ex parte Dubsky & Stark*<sup>4</sup> is one case allowing claims to a physical mixture. Although the components of the mixture (a polymerizable compound and a chelate) were intended to react to form a compound, the mixture had a substantial shelf life and thus could be claimed. The Board implied that, if the reaction were instantaneous, the mixture could not be claimed because it would have no substantial existence.

Special problems come up in the metallurgical arts in claiming new alloys, usually nowadays including changes in proportions of known ingredients to achieve new properties or advantages. Also, as discussed in section 6:6, it is often permissible to refer to an area of a component diagram shown in the drawings to define proportions of ingredients in metallurgical cases.

In the early 1960s, the Board of Appeals settled a long-standing philosophical debate by allowing claims to new atoms. Claim 1 of patent 3,156,523 reads "Element 95" (now called americium) and claim 1 of *patent 3,161,462* reads "Element 96" (curium).<sup>5</sup> The Board of Appeals held that the claims were directed to proper statutory subject matter, but that both elements were anticipated as having been inherently produced in the prior art (Enrico Fermi *et al.* patent), etc. The C.C.P.A. held the elements were neither anticipated nor obvious in view of the prior art, and that any prior production was minuscule and unknown. (Many might question the basic conclusion as to the obviousness of a new atom per se.<sup>6</sup>)

A typical type of claim to a new organic molecule:<sup>7</sup>

**12. A compound having the formula:**



wherein

**R is an alkyl group selected from the group consisting of methyl, ethyl and isopropyl; and**

**X is a halogen selected from the group consisting of chlorine and bromine.**

Note that the foregoing claim covers a total of six specific compounds, for any use to which they can be put. This illustrates the very common class of inventions in which new molecules are claimed by structural formula. It also illustrates the use of what is termed "*Markush*," or alternative, terminology to cover several different compounds with a single claim (see section 6:2).

See section 2:9 for comments on dependent composition claims, and section 6:8 on *Jepson*-type claims in this area.

**Summary** *Composition of matter claims list the chemical ingredients (compounds, elements or radicals) making up the composition or compound. The ingredients or elements may be claimed narrowly (specific named components), with intermediate scope (a group of similar elements functionally equivalent), or broadly as to function performed, where the prior art permits. Where necessary to novelty, etc., the proportions or other conditions or parameters of the compound are stated, usually in ranges of concentration of ingredients. The intended use for the composition (rust inhibition, antibiotic) may or may not be stated in the preamble. (See section 6:7 for details on the effect of preamble limitations.) The problems in chemical practice come primarily with obviousness questions over prior art and how much disclosure is needed in the specification, not primarily in the techniques of drafting claims.*

## 6.2 "Markush" Expressions

*Markush* expressions are alternative expressions described in M.P.E.P. section 2173.05(h):

A Markush claim is commonly formatted as: “selected from the group consisting of A, B, and C;” however, the phrase “Markush claim” means any claim that recites a list of alternatively useable species regardless of format.

*Ex parte Markush* sanctions claiming a genus expressed as a group consisting of certain specific materials. Inventions in metallurgy, refractories, ceramics, pharmacy, pharmacology and biology are most frequently claimed under the *Markush* formula but purely mechanical features or process steps may also be claimed by using the *Markush* style of claiming, see *Ex parte Head*, 214 U.S.P.Q. 551 (Bd. Appl’s 1981); *In re Gaubert*, 187 U.S.P.Q. 664 (C.C.P.A. 1975) and *In re Harnisch*, 206 U.S.P.Q. 300 (C.C.P.A. 1980).

Further, as to the form of language for a *Markush* grouping M.P.E.P. section 2173.05(h) states: “It is improper to use the term ‘comprising’

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instead of ‘consisting of.’” In other words, the group must be recited as closed-ended.

Rather than using “selected from the group consisting of,” one can simply list the group members, with “or” preceding the final member (see below in this section). Although “a” used as an article to introduce a claim element could mean one or more in an open-ended patent claim, “a” used with “consisting of” indicates only one member of a *Markush* group. The claim at issue <sup>8</sup> included a list of Lewis acid inhibitors in a *Markush* group. It later referred to “a” Lewis inhibitor. This was held not to refer to more than one inhibitor, but to indicate only one of those inhibitors. That is because a *Markush* group is closed-ended.

Furthermore, *Markush* grouping can lead to possible double inclusion of a claimed element. An example in the M.P.E.P. section 2173.05(h) is a *Markush* group: “selected from the group consisting of . . . halogen . . . chloro . . .” The group is acceptable although “halogen” is generic to “chloro.” The claim itself must be evaluated for indefiniteness.

The *Markush* expression is commonly used in chemical cases as it deals with naming a selected group of materials. However, practitioners sometimes use them in nonchemical, for example, mechanical and electrical cases, where the rationale for the use of such an expression will equally apply. <sup>9</sup> The Manual section says it may be used for “purely mechanical features,” like simple screws or staples, or even individual large, complex structures. It may be used for “process steps,” for example, gluing or stapling.

A *Markush* group is a sort of homemade generic expression covering a group of two or more different materials (elements, radicals, compounds, etc.), mechanical elements, or process steps, any one of which will work in the combination claimed. However, “the entire [*Markush* group or] element is disclosed by the prior art if one alternative in the *Markush* group is in the prior art.” <sup>10</sup>

There are two requirements to satisfy a *Markush* group: (1) the generic field must be present and (2) one of the specified members of the group must be in the generic field. In *Biovail Laboratories, Inc. v. TorPharm, Inc.*, <sup>11</sup> the claim was “a wetting agent” “from the group consisting of” several chemicals. To meet this claim element, a material must be both the generic “wetting agent” and one of the

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group members. The “wetting agent” was not defined merely by being a member of the group. The court separately construed the term “wetting agent” from the prosecution history, dictionaries, and treatises. In addition, it had to be a group member. But a group member that is not also a wetting agent would not satisfy the generic term “wetting agent.”

The Patent and Trademark Office published guidelines on February 9, 2011, <sup>12</sup> for compliance with the indefiniteness provision of section 112(b). They do not alter any discussion in this section. As another requirement in the guidelines, a *Markush* group is indefinite if the species or members of the group do not share a “single structural similarity” or a common use.

Treatment of a claim element as a *Markush* group occurs even if that treatment was not intended. <sup>13</sup> For example, prior art teaching one member of the group will be prior art as to the entire *Markush* group. <sup>14</sup> If you do not intend to claim a *Markush* group, do not use alternative language for a series of related alternative elements.

A typical example, from the previous section, Claim 12:

. . . a halogen selected from the group consisting of chlorine and bromine.

Note that this covers either chlorine or bromine, either of two specific elements out of five in the halogen group, and acceptable alternative claiming (discussed in section 3:16). The *Markush* doctrine originated out of necessity. In the previous example, there is no generic word for the specified group of two halogens out of five. To refuse a generic claim because of a paucity of language seems unreasonable. Thus, *Markush* language is used to create an artificial generic expression.

Mr. Markush's claim in question involved: "a material selected from the group consisting of aniline and halogen substitutes of aniline."

*Markush* terminology may be used in claims in any of the statutory classes of utility patents; wherever several alternative types of material are involved. Thus, although the claim may be to a mechanical structure, an article of manufacture, the particular element of that structure that is described by a *Markush* expression may be a chemical type limitation. As an example of an article of manufacture, in the resistor of section 5:1, if the only materials that would work for the

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terminal stripes were copper, silver and aluminum, or if for any other reason a claim limited to those three materials were desired, clause (c) of Claim 7 could read as follows: "a stripe of a *conductive metal selected from the group consisting of copper, silver and aluminum* at each end of the core in electrical contact with the carbon coating."

For a process claim including a series of materials or elements that may be used as alternatives, consider the example in section 4:7 of treating polyethylene articles, and suppose that the acid could be only concentrated sulfuric, nitric, or phosphoric acid.

The claim would then read:

**5A. A process for treating the surface of a polyethylene article to increase its receptivity to a printing ink, which comprises: exposing the surface of the article to a saturated solution of sodium dichromate in an acid selected from the group consisting of concentrated sulfuric, nitric and phosphoric acids.**

*Markush* group claiming can be extended to alternative process steps. In a process limitation, the *Markush* group consists of a group of steps: ". . . weakening the bond by a process selected from the group consisting of heating, freezing, and pulling the pieces apart. . . ." In Claim 5A above, the exposing step may be written as an additional *Markush* grouping, "wherein the exposing is performed by a process . . .," or "wherein the exposing step is selected from the group consisting of dipping, spraying and painting" or even "wherein the exposing is done by dipping, spraying or painting," since the "or" alternative is also permitted, see below.

In the foregoing examples, the italics indicate the *Markush* phraseology. The precise format should, but not must, be followed exactly. The *Markush* expression preferably has the form "a \_\_\_\_\_ selected from the group consisting of \_\_\_\_\_ . . . and \_\_\_\_\_." Note that the word "consisting" limits the claim to the named group, as mentioned in section 2:6.

An interesting example is from Stebbings *patent 3,234,948* on a cheese filter cigarette: "2. A cigarette filter according to claim 1, in which the cheese comprises grated particles of cheese selected from the group consisting of Parmesan, Romano, Swiss and cheddar cheeses." This illustrates the use of a *Markush* expression to define one element of an article of manufacture claim.

The claim in which the expression appears may have the transition word "comprising" after the preamble, but the *Markush* expression of the claim may never include "comprising." Instead, the *Markush* expression must begin only with "the group consisting of."

Further, the group members are listed separated by commas. Where the *Markush* expression is introduced by “selected from the group consisting of,” the final member of the group is preceded by the conjunction “and.”<sup>15</sup> Proper practice also permits claiming in the alternative using “or,” if a *Markush* group would have been proper, but then you omit the formulaic “selected from the group consisting of”:

When materials recited in a claim are so related as to constitute a proper *Markush* group, they may be recited in the conventional [Markush] manner, or alternatively. For example, if “wherein R is a material selected from the group consisting of A, B, C and D” is a proper limitation, then “wherein R is A, B, C or D” shall also be considered proper.<sup>16</sup>

Under this modification, in the example of Claim 7, one could recite a “stripe of copper, silver or aluminum. . . .” This is much simpler and covers the same thing as the regular *Markush* form.

Improper use of the *Markush* form, even if unintentional, may have an unexpected result. In *Superguide Corp. v. DirecTV Enterprises, Inc.*,<sup>17</sup> the patentee claimed “. . . information which meet at least one of the desired program start time, the desired program end time, the desired program service, and the desired program type. . . .” The Federal Circuit said that language required one member of each category be present in order to meet the claim element. Had “or” been used in place of “and,” there might have been only need for one element from one category to meet the claim element. Alternatively, had the expression begun “information which meet at least one of the group consisting of the desired program . . . ,” that would have become a properly recited *Markush* group and the patentee’s construction might have prevailed.

There once was a policy against *Markush* claims of diminishing or varying scope (Claim 1—the group A, B, C, and D; Claim 2—A, B, and C), but this is now considered proper *unless* “such a practice renders the claims indefinite [this would be rare] or if it results in undue multiplicity.”<sup>18</sup>

*Markush* claims also may be allowed as subordinate (“subgenus”) claims under a broader (“genus”) claim not naming particular materials<sup>19</sup> (see section 6:9 on generic and species claims). Under this liberalized practice, for example, Claim 1 could cover conductive

materials broadly; Claim 2, a *Markush* group of five materials; Claim 3, a limited group of three preferred materials; etc.

When claiming specific compounds per se (that is, molecules), questions have arisen in how closely related the members of the *Markush* group must be for the claim to be proper: could one claim such disparate things as air, earth, fire, or water? Polypropylene, benzene hexafluoride, tantalum sesquinitride, or undiscovered element 117? M.P.E.P. section 2173.05(h) requires that the materials in the *Markush* group must ordinarily “belong to a recognized physical or chemical class or an art-recognized class.” Air, earth, fire, and water would not suffice.

Unlike *Markush* groupings that recite materials or a compound, *Markush* groups in a claim reciting a process or a combination need not belong to one class.<sup>20</sup> M.P.E.P. section 2173.05(h) says “it is sufficient if the members of the group are disclosed in the specification to possess at least one property in common which is mainly responsible for their function in the claimed relationship, and it is clear from their very nature or from the prior art that all of them possess this property.” This lends itself to making a broad range of mechanical equivalents, sharing one common property, part of a *Markush* grouping: “a resting surface selected from the group consisting of a chair, a bench and a stool.” The *Markush* grouping is more easily explained if the clause including it includes the property that the members of that group possess, for example, “a resting surface.” Alternatively, that property may be recited in a preceding claim without the *Markush* group and the specified group may then be recited in a following dependent claim, as “wherein the resting surface is selected. . . .”

In mechanical cases, there would usually be some generic word available, often a “means for” clause, avoiding the need for *Markush*

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