How an Unfamiliar Thing Should Be Called

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An empirical method is described to derive good names for unfamiliar objects. Three principles were used in deriving the names: (1) The vocabulary and structure of the names should be within the user's linguistic capacities; (2) The names should be informationally efficient, namely, short, but at the same time unique; and (3) The names should form a classification system. For example, most names have a generic term and one or more modifiers.

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These three principles lead to the following design for creating good names: Step 1: Names are generated by a group of subjects. Step 2: From the names generated by subjects, the experimenter chooses a subset of the names according to the following criteria: (a) the modal name is chosen, namely, if a particular name is generated more often than others, it is chosen; (b) shorter names are preferred; (c) names chosen stay within the classification system provided by the subjects. Step 3: How good the names are is tested by measuring (1) how well people can match the names with the objects they describe; and (2) how well they can recall the names, given the physical objects. Steps 2 and 3 can be iterated; namely, if a given name is poorly matched or recalled, it can be replaced by another generated name and tested again. The method results in names that form a classification system and that are natural, short, well matched with their physical referents and well recalled. The method is generalizable and ought to be useful in a large variety of situations where names for unfamiliar objects are needed.

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How An Unfamiliar Thing Should Be Called

An empirical method is described in this paper to derive good names for unfamiliar objects. How good the names are is measured by (1) how well people can match the names with the objects they describe; and (2) how well they can recall the names.

Previous researchers (e.g., Brown (1958), Carroll (1980, 1981), Nelson (1974, 1977)) have investigated naming, including why some names are good and others poor, but the empirical method given here for deriving good names, and for measuring how good they are, has not been presented before. The method is generalizable and has already been successfully used in other situations (e.g., Norman, personal communication) where names for unfamiliar objects are needed.

The stimulus materials to be named were pieces from an assembly kit for the construction of objects, but the method of deriving names is not restricted to these materials. The three principles used in deriving the names are: (1) the vocabulary and structure of the names should be within the users' linguistic capacities; (2) the names should be informationally efficient, namely, short, but at the same time unique; and (3) the names should form a classification system. That is, a name should contain a generic term and, when necessary, one or more modifiers. (As will be seen later, the generic terms are nouns and the modifiers are adjectives and prepositional phrases.)

The three principles above lead to the following design for creating good names:

Step 1: Names are generated by a group of subjects.

Step 2: From the names generated by subjects, the experimenter chooses a subset of the names according to the following criteria: (1) the modal name is chosen, namely if a particular name is generated more often than others, it is chosen; (b) shorter names are preferred; and (c) the names chosen stay within the classification system provided by the subjects.

Step 3: How good the names are is tested by measuring, first, how well people can match the names with the objects they describe, and second, how well they can recall the names, given the physical objects.

Steps 2 and 3 can be iterated: If a given name is poorly matched or recalled, it can be replaced by another generated name and tested again.

The method results in names that form a classification system and that are natural, short, well matched with their physical referents, and well recalled. It ought to be useful in a large variety of situations where names for unfamiliar objects are needed.

Method

Subjects

114 students from introductory psychology classes at the University of Colorado participated as part of a course requirement, 14 in Part 1 and 100 in Part 2.

Materials

The items to be named were the 48 different pieces from an assembly kit, Fischertechnik 50. The kit, made in Germany, is similar to Lego. The manufacturers recommend its use by children as young as six through adults. Pieces are made of plastic or metal or rubber, colored red, grey, silver, and black. The largest piece measures 90 x 45 mm (3.54 in x 1.77 in), and the smallest is 5 mm^2 (.2 in^2).

Procedure

The procedure is in two parts. In Part 1, subjects generate names for the pieces, and the modal name for each piece is formed. Part 2 includes an iterative technique of matching and recall of the modal names on iteration 1, followed by matching and recall of improved names on iterations 2 and 3. It also includes matching and recall of the names of the pieces given by the manufacturer.

Procedure for Part 1

Subjects were run in groups of one to four until 14 had been tested. Each was shown the Fischertechnik 50 kit, in an open box, packaged as it comes from the manufacturer and including 120 total and 48 different pieces, and actual models of a few constructions that could be made with the kit. Each subject was given a separate collection of the 48 different pieces in the kit. Subjects were instructed to name each piece. They were told that the goal of the research was to use the names generated by subjects to derive good names that could be used in assembly instructions. Each subject was given a sheet with 48 numbered blanks on which the names were to be written, and a folder containing 48 numbered color photos of the pieces. The name for the piece in photo one was to go in the first blank, etc. Subjects were encouraged to ask if they were at all unsure which piece was pictured in a given photo. Subjects were allowed to slide or snap pieces together, to determine how they could potentially be used, and they could generate names for the pieces in any order.

Results of Part 1

The names generated by subjects were analyzed for generic terms or categories, and specific modifiers. For example, generic terms included joint, plate, block, and wheel. Specific modifiers included small, grey, notched, and narrow.

The subject-generated generic terms and modifiers for each piece were formed into a composite naming diagram, a display of the words, with synonyms in columns. In order for a word to occur on the diagram, it had to be generated by at least two subjects. This restriction eliminated uncommon words such as perforated, anvil, pyramid, and canopy. Figure 1 shows an example of a composite naming diagram. The piece named in Figure 1 is shown in Figure 2.

Insert Figures 1 & 2 About Here

From the composite naming diagram for each piece, the most common name was chosen. That is, from synonyms on the diagram, one was chosen, utually because the majority of subjects used it. For example, within a given category, if most people called the objects blocks, but others called them bricks or girders, the name block was chosen. An important consideration was the number of words per name. The criterion for choosing the most common name was to select a short one, preferably not longer than the average number of words generated per name for the piece.

The 48 most common names from the composite naming diagrams, called iteration 1 names, were used to begin the iterative procedure to improve names in Part 2.

Part 2 (Iterative Procedure)

The iteration 1 names were tested for matching and recall, and an iterative technique was used to improve the names.

Procedure for Part 2

The procedure was identical for four different groups. The difference was the 48 names a particular group was given. Group 1 was given iteration 1 names. Groups 2 and 3 were given improved names, in iterations 2 and 3. Group 4 was given the names from the manufacturer's instruction booklet. The procedure for Group 1 is described.

Subjects were run in groups of less than 5 until 26 had been run in Group 1. (There were 24 subjects in Group 2, 26 in Group 3, and 24 in Group 4.) Each subject was given 4 sheets with the 48 iteration 1 names, 12 per page, in random order. (The order was the same for all 26 subjects. Also, the order was identical for all 4 groups.) Each was also given a collection of the 48 actual pieces. The subject was asked to place each piece on its correct name, a matching task. Subjects were

told there was no time limit, and that they could change around the pieces until they were satisfied.

When the subject finished this task, the experimenter checked the matches, marked the errors on the sheets by writing the photo number of the incorrectly placed piece in the blank where the subject has put it, and correctly identified each wrongly matched piece by saying its name aloud. The subject was then given a surprise recall task. A sheet with 48 numbered blanks and a folder with 48 numbered color photos of the pieces were given to the subject. The task was to write the correct name of the piece, exactly as given in the matching task, in each blank. Subjects were told there was no penalty for guessing on the recall task, and they could recall the names in any order.

When subjects were making a systematic error on matching or recall, the name of the piece(s) causing the error was changed by the experimenter for the next iteration (Group 2, and then Group 3). In scoring the matching task, the errors clearly indicated misleading names. These names were changed. Usually a new name from the composite naming diagram was selected. Sometimes, when the composite naming diagram did not suggest a new name, more subjects generated names for the piece(s), and a new name was chosen from the new composite naming diagram.

If a new name involved a change in category for a piece (as "strip" to "rail", or "plate" to "platform"), names of all other pieces in that category were changed to the new one.

Results and Discussion

Table 1 shows percentage correct on matching and recall for the names of iterations 1, 2, and 3 and the manufacturer's names, and the average number of words per name. Recall was scored as follows: When there was any deviation from the

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Insert Table 1 About Here

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correct name, no credit was given. Table 1 shows that in general, as iterations progressed, names became shorter and were better matched with their physical referents and better recalled. All groups with subject-derived names (iterations 1, 2, and 3) substantially out-performed the group with the manufacturer's names.

Table 2 shows percentage correct on matching and recall for three of the 48 pieces, in each of the four groups. Drawings of the three pieces are shown in

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Insert Table 2 & Figures 3 & 4 About Here

Figures 2, 3, and 4 respectively. Data from some pieces show that recall of the same name is better on a later iteration than on an earlier one. This is the case for the name of piece number two from iteration 2 to iteration 3. Recall increased from 29% to 50%. The name (smooth red wheel) became better because changes in other names from iteration 2 to iteration 3 created a more suitable or more consistent classification.

What we have derived here is a naming schema, a system of terminology. The names created are used within the conceptual context of the 48 pieces in the assembly kit. The same name might not be good in another context. For example, for a subset of the pieces subjects would drop the redundant elements. If 200 more pieces were added, the names would be inadequate and more nouns and modifiers would be needed. Also, the names derived would obviously differ for different subject populations, with a classification system still emerging. (Pilot data show that the composite name for the piece in Figure 2 from a group of 60 children aged 3 through 12 is big fence.)

The number of iterations needed to derive the names will probably vary with the items to be named. In this study, only three iterations were used because the score on the matching task on iteration three was nearly 100% and therefore could not be significantly increased. Correct recall seems to have stablized around 50%. If some other measures of good names were used, for example, correct recall after a delay, perhaps more iterations would still improve the names according to the new measuring criteria.

Due to linguistic structure (or linguistic habit) subjects create names according to a classification system. They seem to choose a generic name for a category that is a noun, and modify it with adjectives or a prepositional phrase. The modal classification schema derived from subjects seems to be acceptable by other subjects, as measured by matching and recall.

We expect that the experimentally designed naming schema will apply in a large variety of situations, not because it worked for the pieces in an assembly kit, but because the efficient choice of names and classifications of objects into categories seems to be a universal strategy for relatively well educated people who try to verbalize their experience.

Reference Note

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Footnote

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Table 1

Percentage Correct on Matching and Recall, and Average Number of Words Per Name, for Each of the Four Groups

Group Given	Percentage Correct: Matching	Percentage Correct: Surprise Recall*	Average Number of Words Per Name
Names From Manufacturer	59.89	27.25	2.94
Iteration 1 names	89.20	48.64	2.75
Iteration 2 names	93.92	48.60	2.81
Iteration 3 names	96.23	50.72	2.60

* No variation was scored as correct. For example, for the triangle joint, the name triangular joint was scored as wrong.

Table 2

Percentage Correct on Matching and Recall

For Three of the 48 Pieces

		Percentage Correct: Matching	Percentage Correct: Recall
Piece 1	Manufacturer's name: base plate 90 x 45	83.3	8.3
(shown in	Iteration 1 name: large base plate	92.3	61.5
Figure 2)	Iteration 2 name: large plate with holes	100.0	50.0
	Iteration 3 name: large platform	92.3	73.1
Piece 2	Manufacturer's name: wheel 23	16.7	12.5
(shown in	Iteration 1 name: red wheel	73.1	26.9
Figure 3)	Iteration 2 name: smooth red wheel	100.0	29.2
	Iteration 3 name: smooth red wheel	96.2	50.0
Piece 3	Manufacturer's name: building block 7.5	16.7	20.8
(shown in	Iteration 1 name: red H joint	73.1	15.4
Figure 4)	Iteration 2 name: grooved H joint	75.0	12.5
	Iteration 3 name: H joint	88.5	30.8

Note: 24 subjects participated in matching and recall of the manufacturer's names. There were 26, 24, and 26 subjects respectively in iterations 1, 2, and 3.

Figure Captions

Figure 1. A composite naming diagram for the piece shown in Figure 2. The frequency of mentioning occurs under the word in parentheses.
Data are from 14 subjects.
Average number of words per name for this object: 2.79.
Composite name chosen for iteration 1: large base plate.
Words that were used once and thus were excluded from the diagram are:
modifiers: thick, multipurpose, perforated, red, with holes.
nouns: bar, floor, fork, panel, waffle, zigzag.

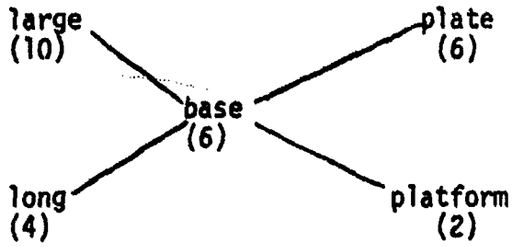
Figure 2. A piece from the assembly kit. Its actual size is 90 x 45 x 5 mm (3.54 x 1.77 x .2 in). Its composite naming diagram is shown in Figure 1.

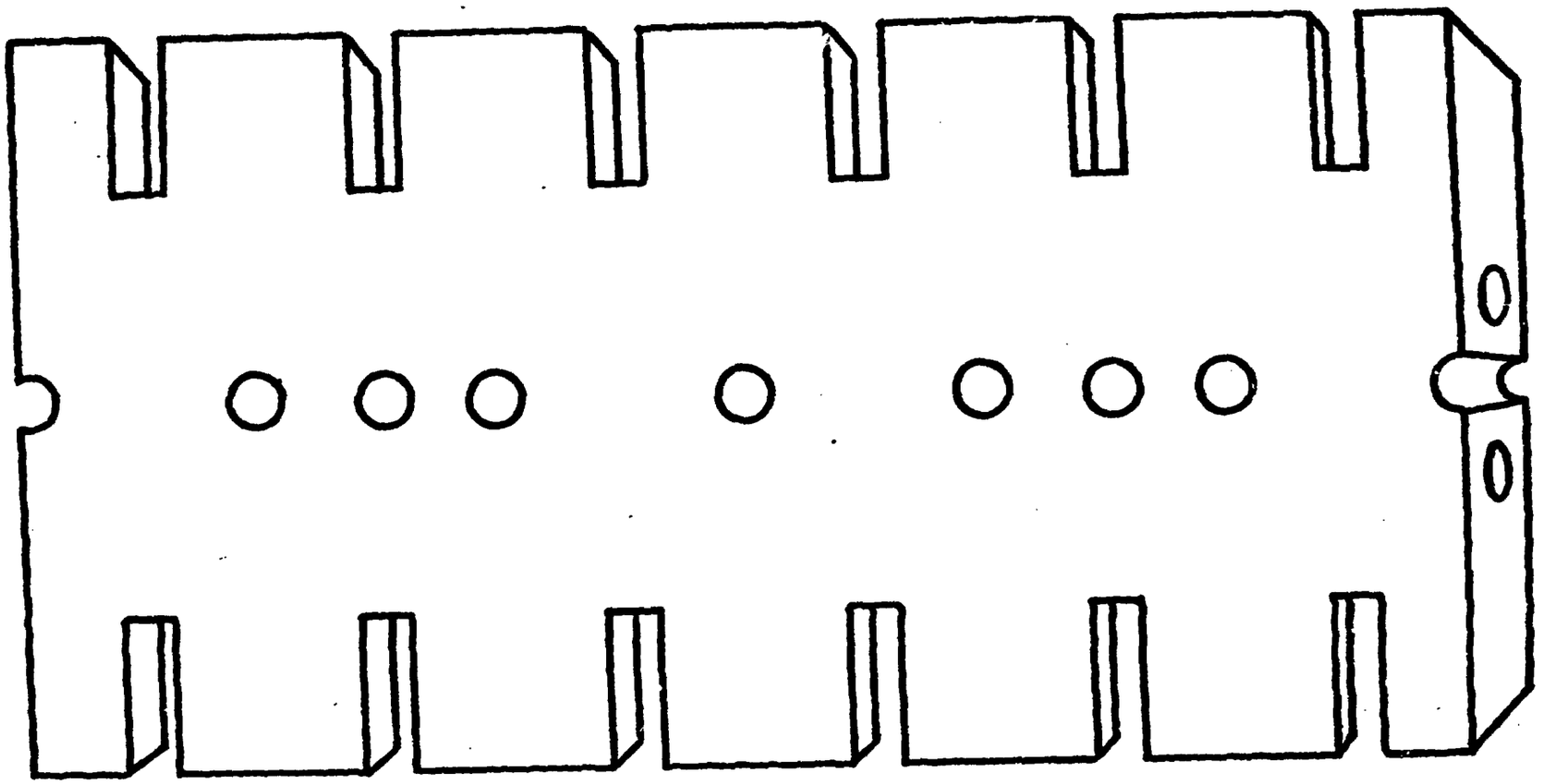
Figure 3. A piece from the assembly kit. Its actual size is 23mm (diameter) x 9.5mm (.9 in diameter x .375 in).

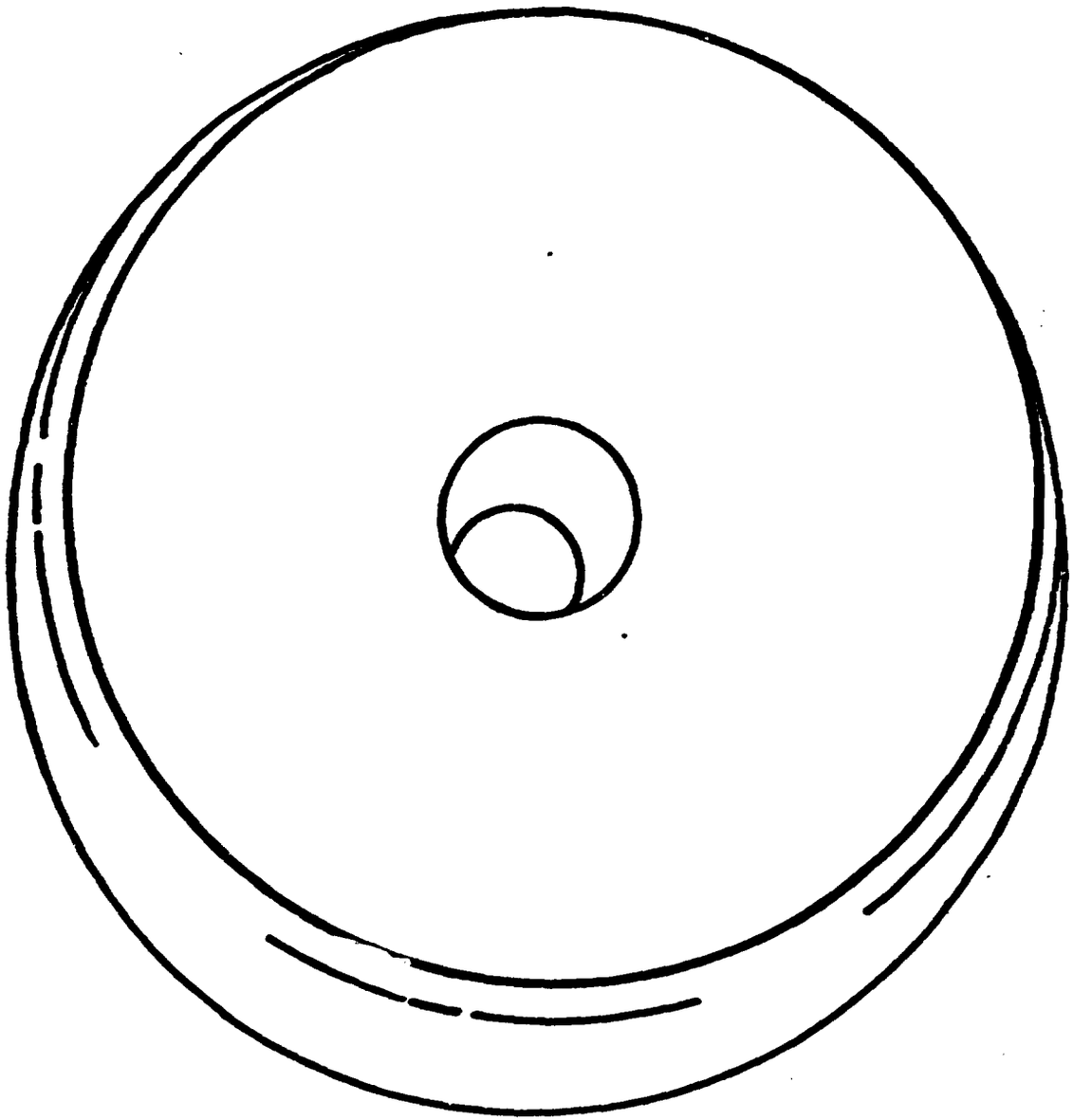
Figure 4. A piece from the assembly kit. Its actual size is 15 x 15 x 7.5mm (.6 x .6 x .3 in).

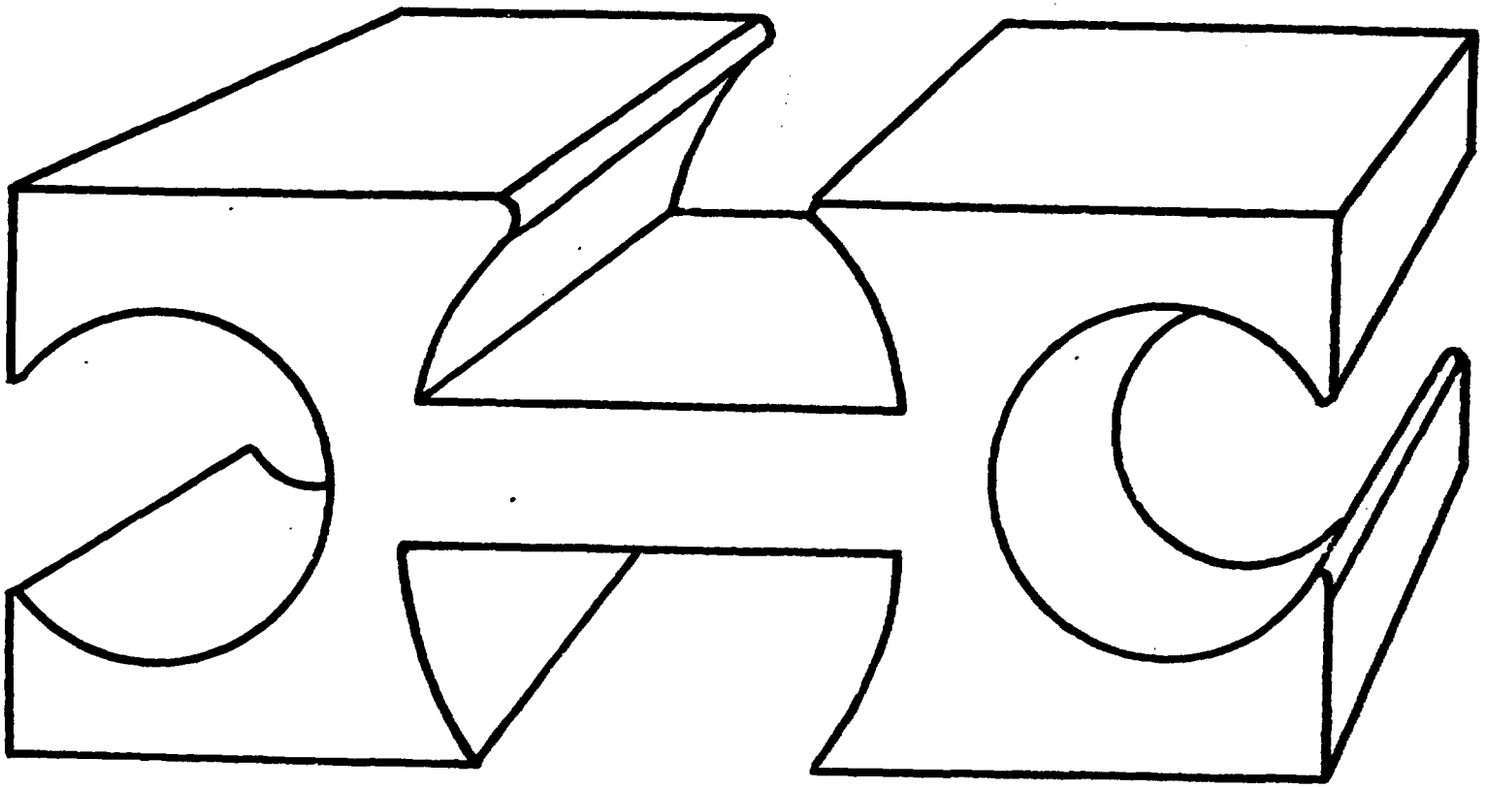
Figure 1

A Composite Naming Diagram For One Piece









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