



28th Annual **INCOSE**
international symposium

Washington, DC, USA
July 7 - 12, 2018

A Framework for Concept and its Testing on Patents

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Importance of Conceptual Design



Conceptual design “significantly affects the product novelty, performance, robustness, development time, value, and cost” (Kroll et al. 2001)



Objective of Work

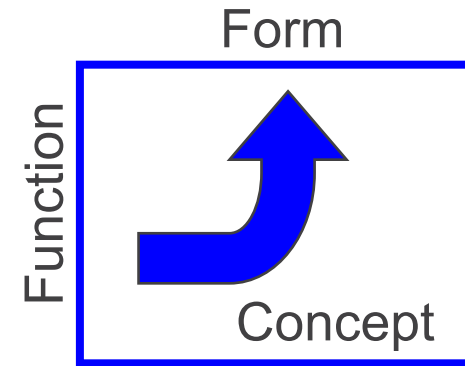
- Develop a model-based concept framework that represents concept's constituents, their definitions and interconnections
- Enable model-based conceptual design in concurrent engineering design environment
- Assess the proposed concept framework by mapping eight US patents, representing a broad spectrum of engineering systems and methods, to the concept framework



What is Concept?

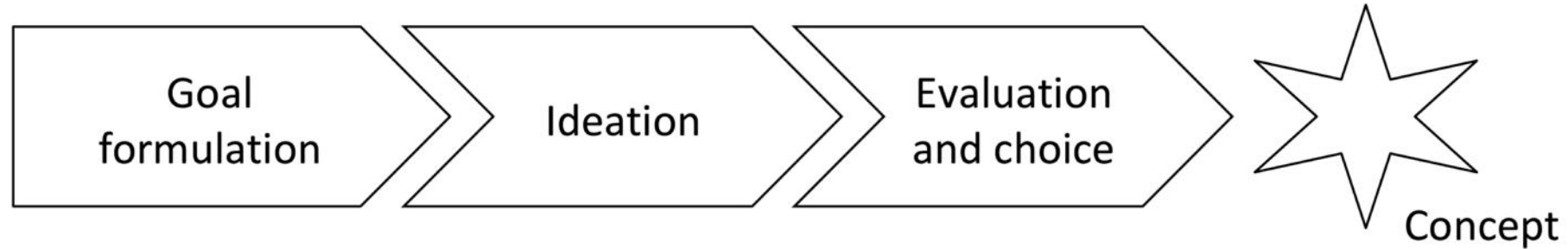
A product or system vision, idea, notion or mental image which maps Function to Form

- Embodies *principle of operation*
- Includes an *abstraction of form*
- Outlines the solution to come
- Establishes the solution-specific vocabulary
- After the fact, concept rationalizes the architecture





Contemporary Concept Synthesis



Three major steps of Concept Synthesis Model (from Andreasen et al. 2015)

- Creative conceptualization
- A human process
- Not easy to represent analytically
- No indication of completeness or optimality



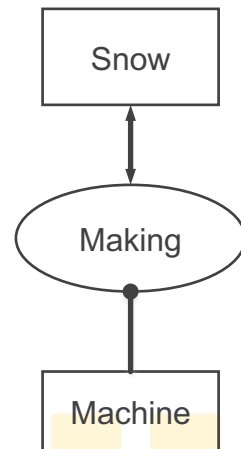
Adding Analytical Conceptualization

- Support brainstorming and creativity
- Analytical representation
- Comprehensive coverage of space
- Record and inventory of concepts
- Support of Concurrent Design Facilities

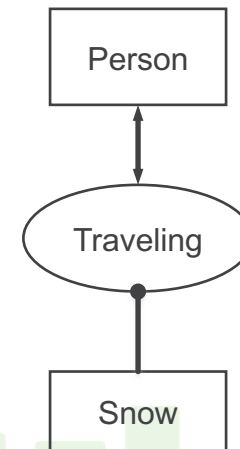
Essentials of Concept



Snow Machine



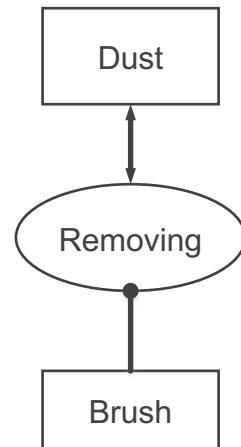
Snow Machine



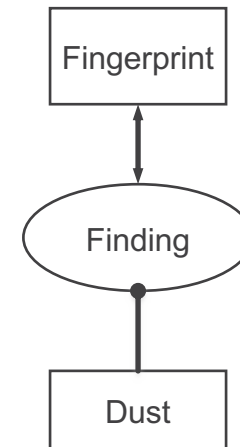
Essentials of Concept (2)



Dusting



Dusting

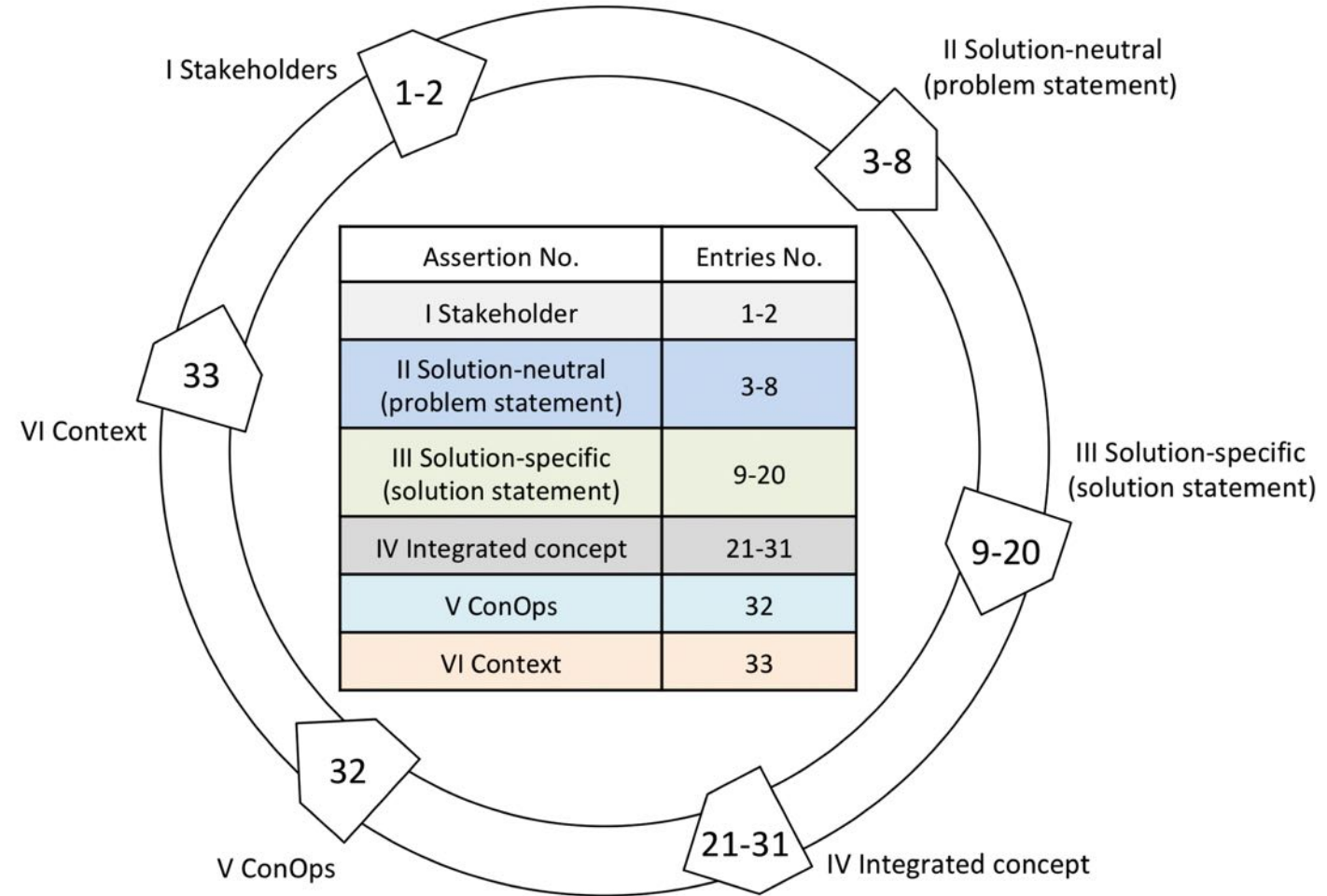




Concept Framework Model

Assertions of concept framework:

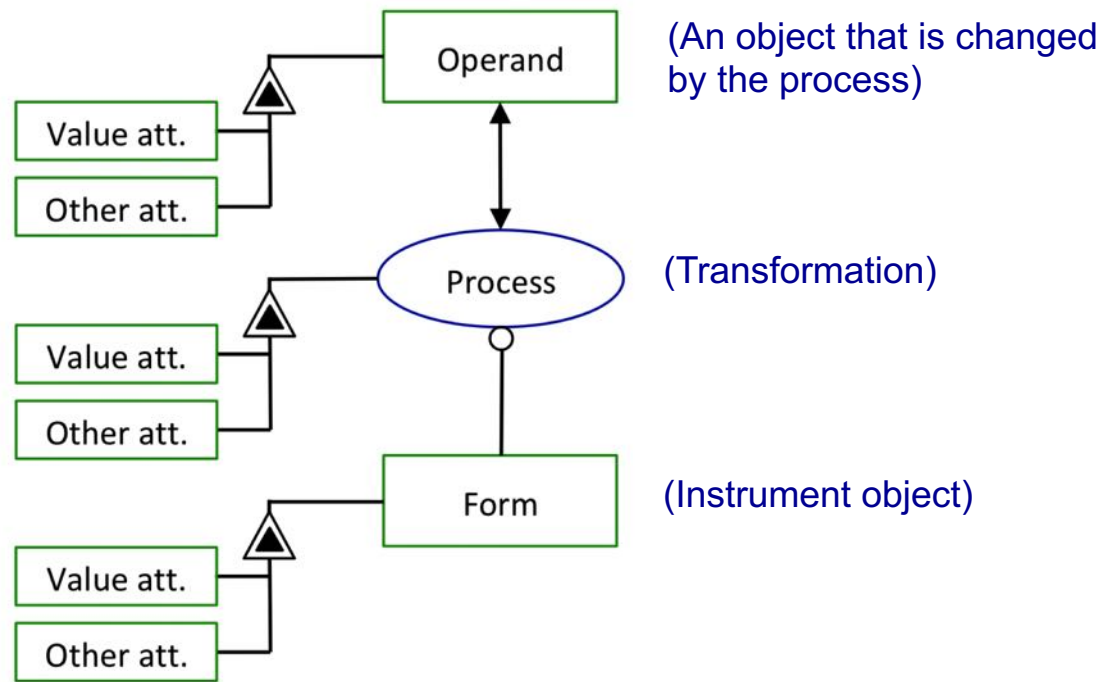
- I. Stakeholder
- II. Solution-neutral (problem statement)
- III. Solution-specific (solution statement)
- IV. Integrated concept
- V. ConOps
- VI. Context



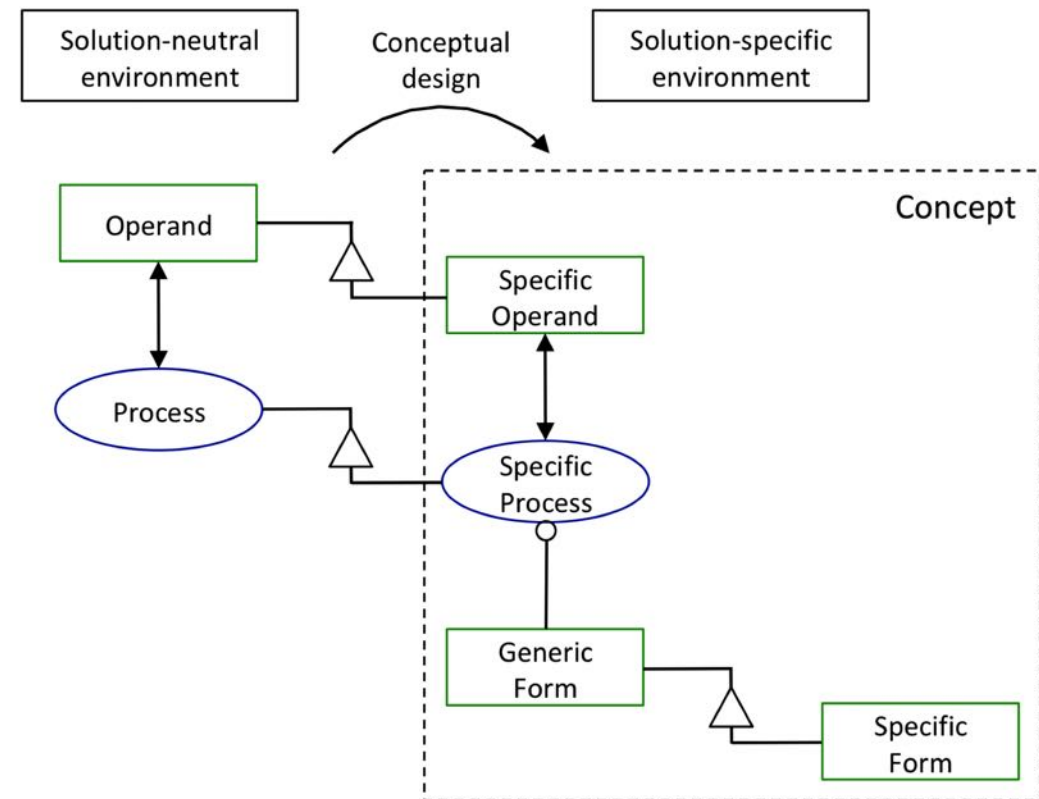


Model-Based Canonical Representation of System

Canonical Representation of system



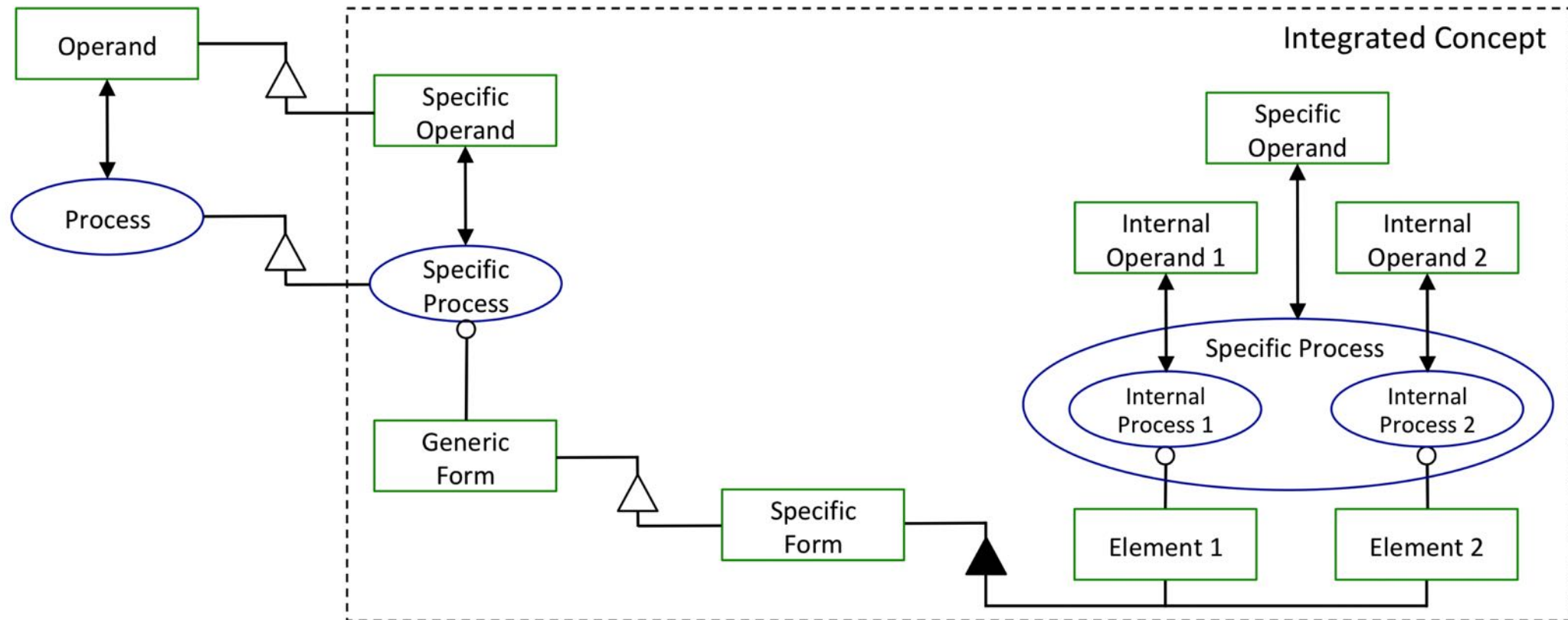
Representation of conceptual design





Model-Based Integrated Concept

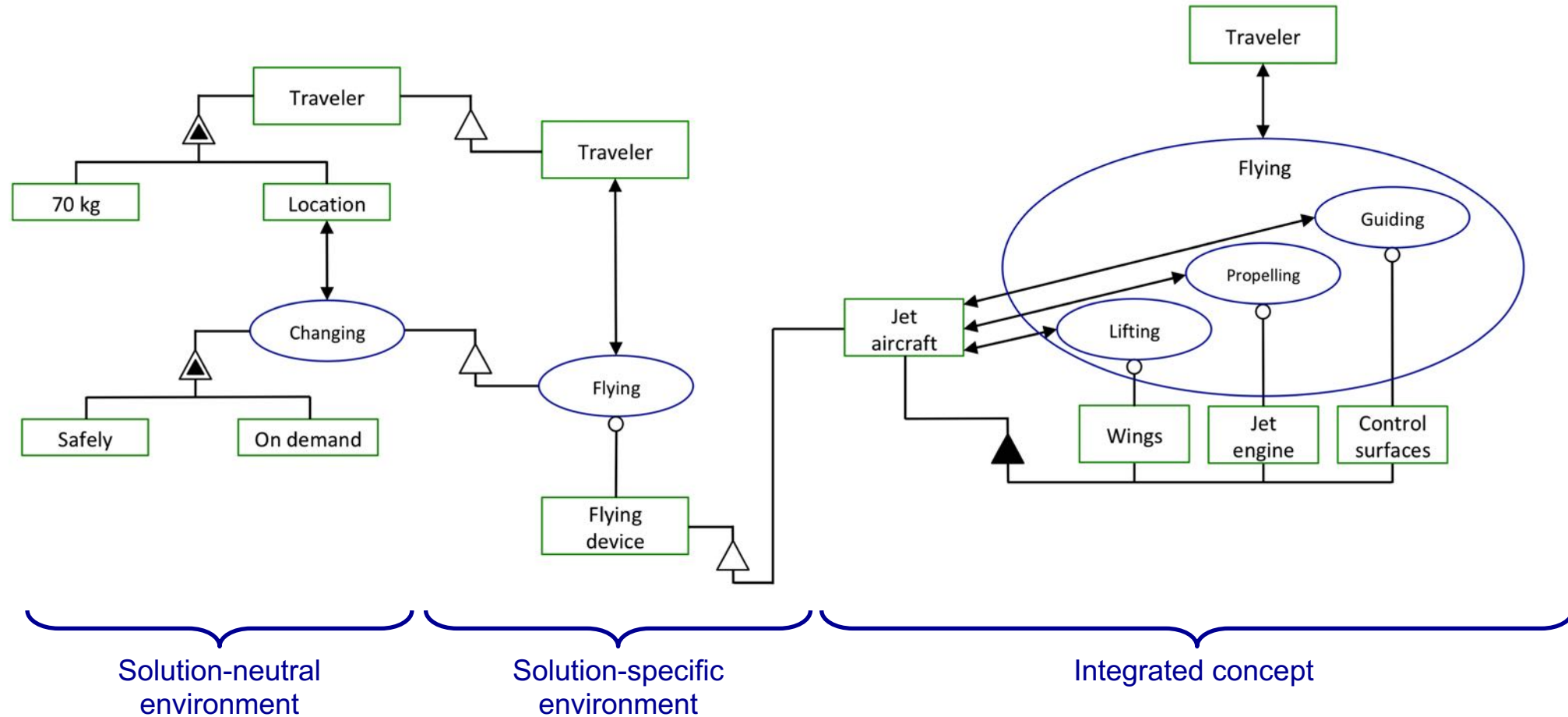
Conceptual design extended to include the integrated concept





Integrated Concept for Air Transportation Service

Integrated concept framework for air transportation service





Patents surveyed

- Because they represent new intellectual property in the form of an invention, a patent almost certainly must contain a concept (which is novel, not obvious and reduced to practice)

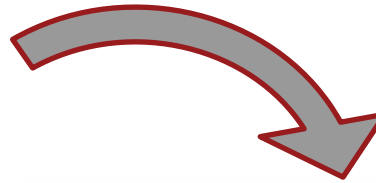
Electro-mechanical patents

Software patents

Biological patents

Thermodynamic patents

Mapping Patents to Framework



US009084459B2

(12) **United States Patent**
Fazackerley et al.

(10) Patent No.: **US 9,084,459 B2**
(45) Date of Patent: **Jul. 21, 2015**

(54) CONTAINMENT MAT THAT CONVERTS TO LUGGAGE WITH SECURE SEAL

(76) Inventors: Amy S. Fazackerley, Alexandria, VA (US); Adam D. Fazackerley, Alexandria, VA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 12 days.

(21) Appl. No.: 13/137,762
(22) Filed: Sep. 12, 2011

(65) **Prior Publication Data**
US 2012/0128268 A1 May 24, 2012

Related U.S. Application Data
(60) Provisional application No. 61/344,922, filed on Nov. 18, 2010.

(51) Int. Cl. A45C 9/00 (2006.01)
A45C 13/10 (2006.01)
A45C 3/00 (2006.01)

(52) U.S. Cl. CPC A45C 9/00 (2013.01); A45C 13/1046 (2013.01); A45C 3/00 (2013.01)

(58) **Field of Classification Search**
CPC A45C 9/00; A45C 13/1046; A45C 3/00; A45C 3/10; A47G 9/062; A45F 4/02; B65F 1/00006
USPC 383/4, 6, 17, 71, 72, 75, 76; 224/156
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS
977,129 A * 11/1910 Reynolds 4,621
1,629,723 A * 5/1927 Moser 604/262

Primary Examiner — Jes F Pusca
Assistant Examiner — Peter Helvey
(74) Attorney, Agent, or Firm — MH2 Technology Law Group, LLP

(57) **ABSTRACT**
A convertible luggage device that opens to form a mat or work surface that has a raised lip or edge structure that contains items on the mat or work surface. The convertible luggage device closes from the mat configuration to create a sealed bag or sealed flexible container for holding the items inside, where the seal is formed by the lip or edge structure. In some embodiments, the convertible luggage device may include a cinch cord that can be used to change from the open mat configuration into the closed bag configuration. In such embodiments, the cinch cord may include a cord lock that may be adjustably deployed to clamp the cinch cord in a position that maintains the convertible luggage device in a closed bag configuration.

29 Claims, 10 Drawing Sheets

Stakeholders	Solution-neutral (Problem statement)	Solution-specific (Solution statement)	Integrated concept	Concept of Operations	Context
1. Who are the stakeholders ?	9. What is the solution-specific operand ?	21. What is the internal operand ?			
2. What are the needs of stakeholders ?	10. What is the value attribute of the solution-specific operand?	22. What is the value attribute of internal operand?			
3. What is the solution-neutral operand ?	11. What is the other attribute of the solution-specific operand?	23. What is the other attribute of internal operand?			
4. What is the value attribute of the solution-neutral operand?	12. What is the solution-specific process ?	24. What is the internal process ?			
5. What is the other attribute of the solution-neutral operand?	13. What is the value attribute of the solution-specific process?	25. What is the value attribute of internal process?			
6. What is the solution-neutral process ?	14. What is the other attribute of the solution-specific process?	26. What is the other attribute of internal process?			
7. What is the value attribute of the solution-neutral process?	15. What is the generic form ?	27. What is the element of specific form?			
8. What is the other attribute of the solution-neutral process?	16. What is the value attribute of the generic form?	28. What is the value attribute of the element of specific form?			
	17. What is the other attribute of the generic form?	29. What is the other attribute of the element of specific form?			
	18. What is the specific form ?	30. What is the structure ?			
	19. What is the value attribute of the specific form?	31. What are the interactions ?			
	20. What is the other attribute of the specific form?	32. What is the concept of operations ?			
		33. What is the context ?			

Results of experiment



Where in the patent is the information drawn from?

A – Abstract

D – Description

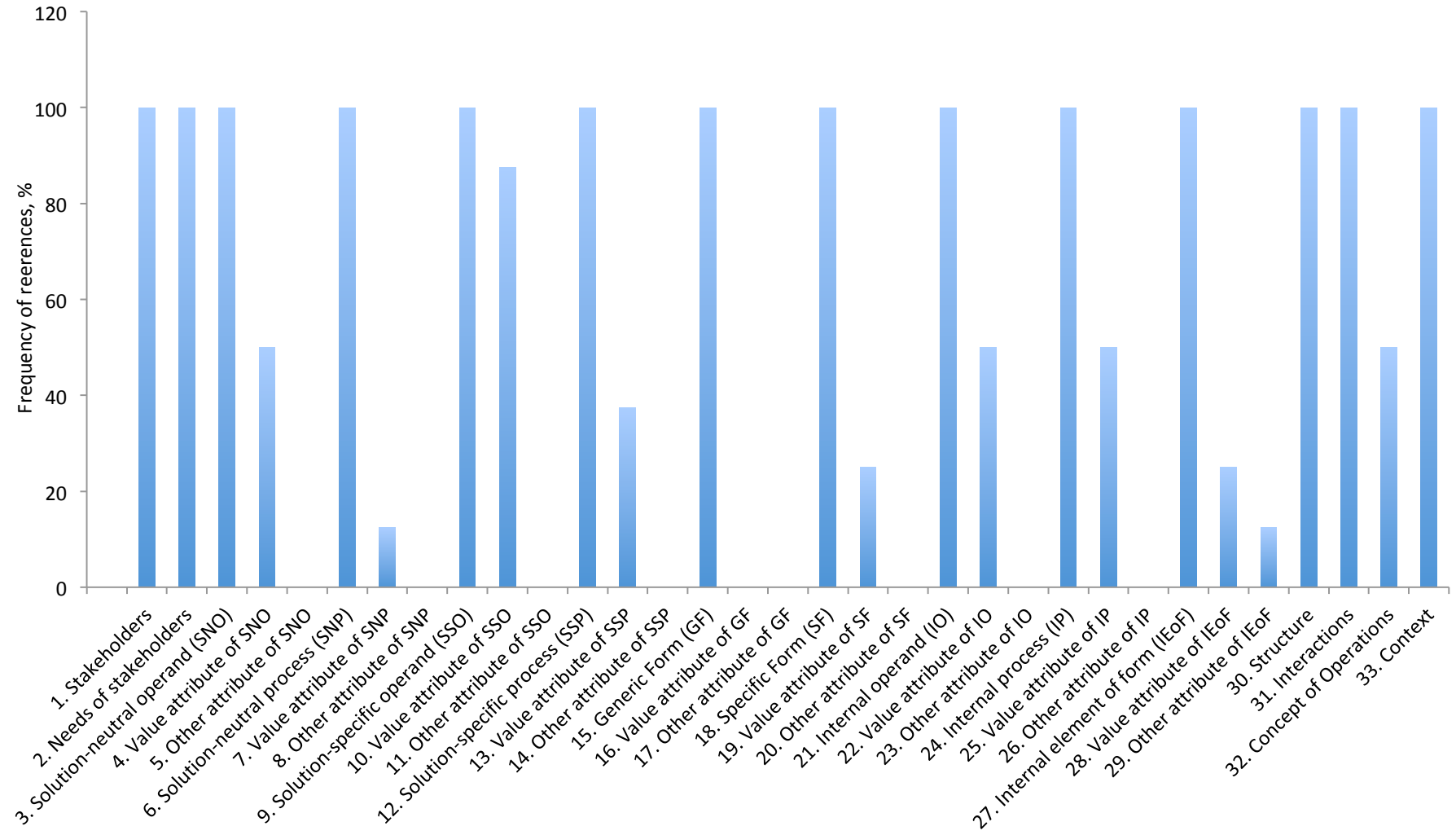
C – Claims

Name	# of Patent								Occurrence, %
	1	2	3	4	5	6	7	8	
1. Stakeholders	D	D	D	D	D	A	D	D	100
2. Needs of stakeholders	D	D	D	D	D	D	D	D	100
3. Solution-neutral operand (SNO)	D	D	D	A	D	D	D	D	100
4. Value attribute of SNO	D	D	D	A	-	-	-	-	50
5. Other attribute of SNO	-	-	-	-	-	-	-	-	0
6. Solution-neutral process (SNP)	D	D	D	D	D	D	D	D	100
7. Value attribute of SNP	D	-	-	-	-	-	-	-	12,5
8. Other attribute of SNP	-	-	-	-	-	-	-	-	0
9. Solution-specific operand (SSO)	A, D	A, D	A	D	D	D	D	D	100
10. Value attribute of SSO	A, D	A, D	-	D	A	A, D	C	D	87,5
11. Other attribute of SSO	-	-	-	-	-	-	-	-	0
12. Solution-specific process (SSP)	A, D	A, D	A	D	A	A, D	C	D	100
13. Value attribute of SSP	A, D	A, D	A	-	-	-	-	-	37,5
14. Other attribute of SSP	-	-	-	-	-	-	-	-	0
15. Generic Form (GF)	D	D	D	D	D	D	D	D	100
16. Value attribute of GF	-	-	-	-	-	-	-	-	0
17. Other attribute of GF	-	-	-	-	-	-	-	-	0
18. Specific Form (SF)	A, D	A, D	A	D	A	A, D	A, D, C	A	100
19. Value attribute of SF	D	A, D	-	-	-	-	-	-	25
20. Other attribute of SF	-	-	-	-	-	-	-	-	0
21. Internal operand (IO)	D, C	D, C	D, C	C	D, C	C	A, D, C	C	100
22. Value attribute of IO	D, C	D, C	D, C	-	D, C	-	-	-	50
23. Other attribute of IO	-	-	-	-	-	-	-	-	0
24. Internal process (IP)	D, C	D, C	D, C	C	D, C	C	A, D, C	A, D, C	100
25. Value attribute of IP	-	-	-	C	-	C	A, D, C	A, D, C	50
26. Other attribute of IP	-	-	-	-	-	-	-	-	0
27. Internal element of form (IEoF)	D, C	D, C	D, C	C	D, C	C	A, D, C	A, D, C	100
28. Value attribute of IEoF	D, C	D	-	-	-	-	-	-	25
29. Other attribute of IEoF	-	D	-	-	-	-	-	-	12,5
30. Structure	D	D	D	D	D	D	A, D	D	100
31. Interactions	D	D	D	D	D	D	A, D	D	100
32. Concept of Operations	A, D	A, D	A, C	A, D, C	-	-	-	-	50
33. Context	D	D	D	D	D, C	D	D	D	100

Results of experiment



- Other attributes can be omitted
- Extended concept is required
- Operator should be added





Conclusions

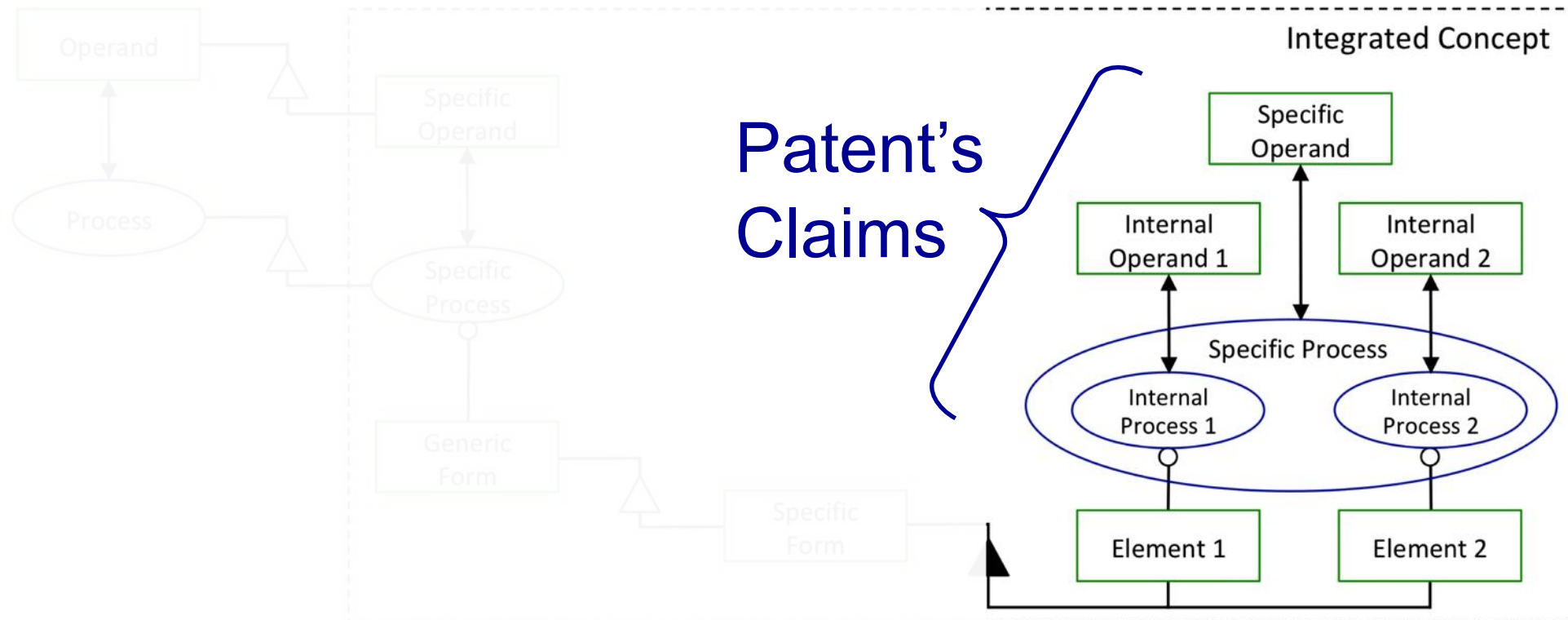
- Concept Framework
 - Provides naming convention based on essentials
 - Provides a template (syntactic and semantic) to describe the essential elements
 - Supports Integrated Concept
 - Supports mixing and matching of internal processes and instrument
- Framework validated (passed necessary condition) based on small N US patent study
 - Affirms that extended concept must be included in a complete definition of a concept
- A supplement to, not a replacement for traditional creative human conceptualization





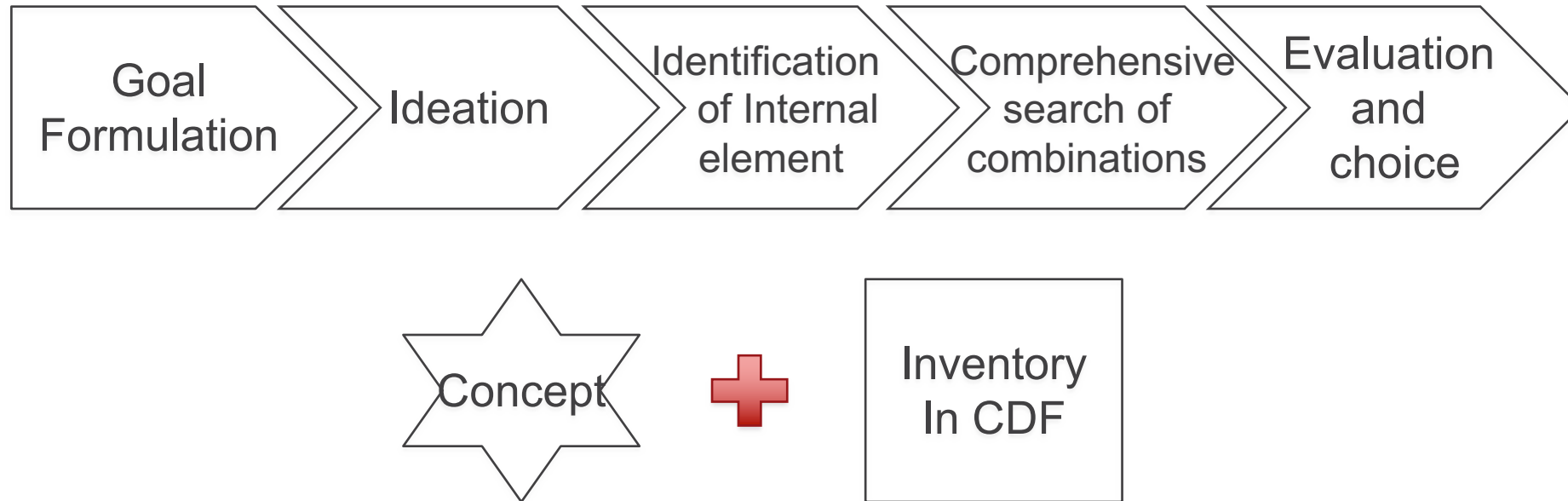
Claims and Integrated Concept

The claims section of a patent, the key area of legal protection, contain information on form and function at one level of decomposition below the concept itself, in what we call the integrated concept





Combined Concept Synthesis





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Thank you for your attention!

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