UNIVERSITY of NEW HAMPSHIRE

SCHOOL of LAW

Patent Landscape Overview for Motorized, Motion Actuated Prosthetic Hand

ITTI
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THE FRANKLIN PIERCE Center for INTELLECTUAL PROPERTY

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OVERVIEW OF THE TECHNOLOGY

Prosthetic arm:

i. Requiring the patient to use the healthy shoulder for actuation of the gripper

ii. Reduced actuation force

iii. Embedded electronic system appropriately drives the motor enabling the gripper to open or close

iv. Patient controls the magnitude of gripping force through his shoulder movement

WHY CONDUCT PATENT SEARCH?

- To avail oneself of a snapshot of the existing art
- Find out what others are doing in a particular technology field
- Determine relevant key players in a particular technology field (e.g. inventors, assignees, licensees etc.)
- Determine whether or not user's invention will infringe other's patent
- Learning tool in a particular technology field
- Find out about the technology trend in relevant field
- Determine whether relevant technology is free to use- Is the technology still covered by a patent? If so, where? Till when?

SEARCH METHODOLOGY (Step1)

Compile relevant keywords

Prosthetic	Arm
Robotic	Wrist
Artificial	Limb
Mechanical	hand
Biomimetic	appendage
Bionic	Upper extremity
Bioelectric	
Electronic	
Myoelectric	

SEARCH METHODOLOGY (Step2)

Use the keywords to generate a simple Boolean logic search query. For Example:

(Prosthe* or robot* or artificial or mechani* or biomimetic or bionic or bioelectric* or electric* or electronic or sensor* or myoelectric*) adj (arm or wrist* or limb* or hand* or appendage* or (upper adj extremit*)))

SEARCH METHODOLOGY (Step3)

- Use the search query to retrieve core patent documents from online patent database.

- We primarily use Thomson Innovation using the search field of "Title, Abstract and Claims"

- We also use other databases: Delphion, Patent Storm, USPTO etc.

SEARCH METHODOLOGY (Step3)

SEARCH METHODOLOGY (Step 4)

- Identify most relevant patent documents

SEARCH METHODOLOGY (Step 4)

Publication Number	Title	US Class - Main	Application Year
US5480454A	Control system for prosthetic devices	623024	1994
US2259911A	Mechanism for operating artificial limbs	623026	1937
US4094016A	Artificial hand and forearm	623024	1976
US2445711A	Mechanical movement	623058	1946
US2580987A	Electrically operated artificial arm for above-the-elbow amputees	623024	1948

SEARCH METHODOLOGY (Step 5)

Based of the initial results, IDENTIFY the relevant:

i. United State Patent Classifications (US Class); and

ii. International Patent Classifications (IPC)

SEARCH METHODOLOGY (Step 6)

- Use the keywords in conjunction with the identified classification codes to get relevant patent documents.
- Go through the patent documents to ensure that they are relevant to technology at hand.

SEARCH METHODOLOGY (Step 7)

- Retrieve more patent documents by forward citation of the identified relevant ones.

- Forward citation: Newer patent documents that reference to older ones because of their related contents.

SEARCH METHODOLOGY (Step 7) Forward Citation Map
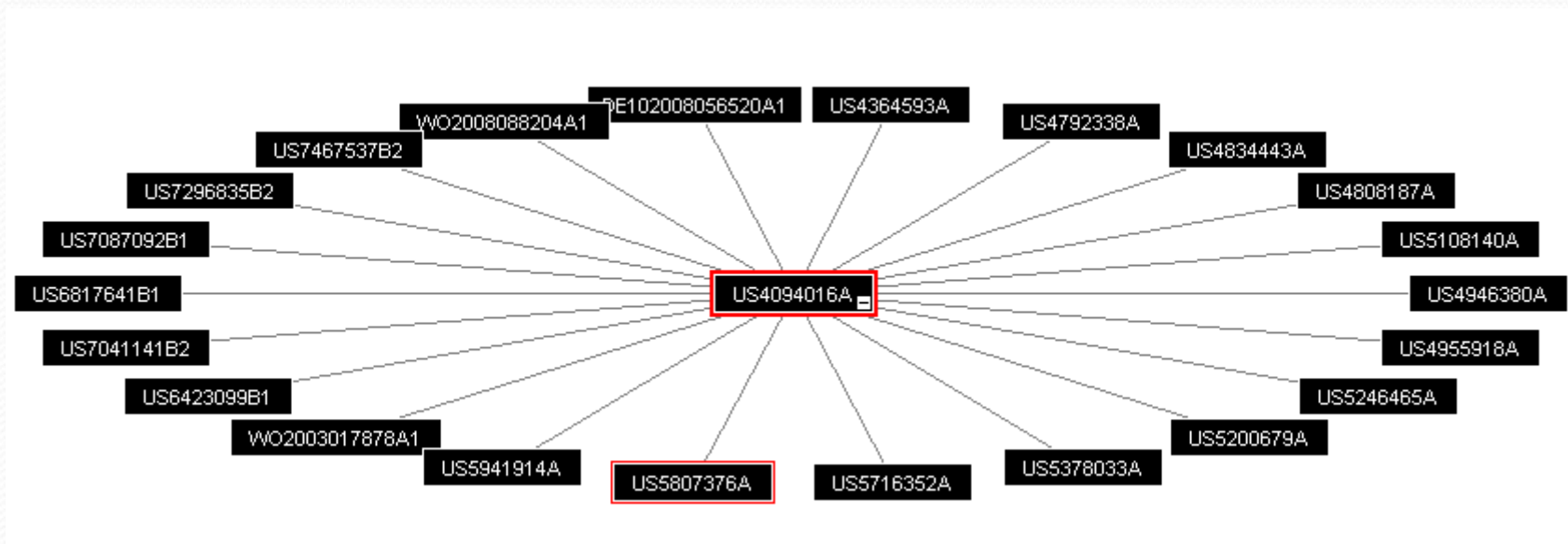
SEARCH METHODOLOGY (Step 8)

- Pool all the patent documents
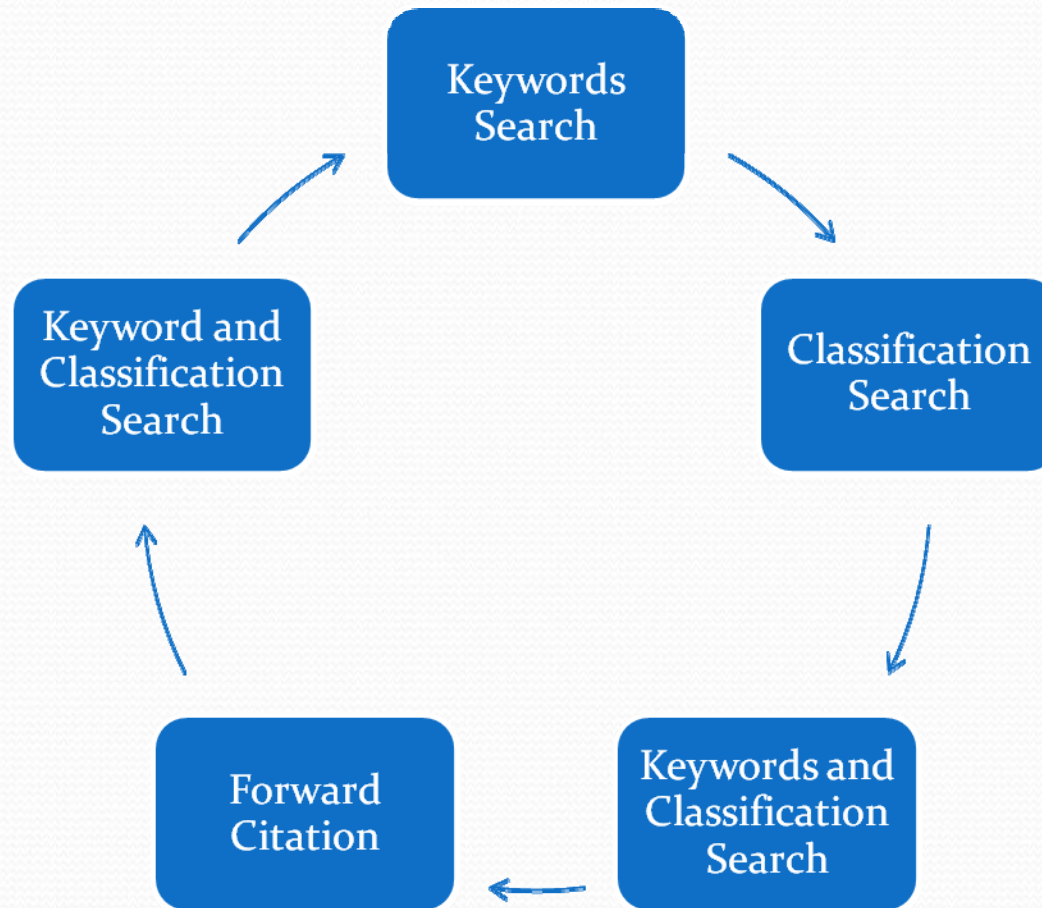- Parse through the pooled documents using the combination of keywords and classification search.
- Identify the relevant patent documents

SEARCH METHODOLOGY
Iterative and Redundant Approach

Patent Classifications

1) What are they?
2) Why are they important in patent landscaping?

Patent Classifications

- WHAT ARE THEY?
- A Patent Classification is a code which provides a method for categorizing the invention.
- Typically expressed as "623/24"
- 623= Class
- 24= Subclass

Patent Classifications

- Class = broadly categorized based on type of invention
- For example, 623 relates all the inventions regarding: PROSTHESIS (I.E., ARTIFICIAL BODY MEMBERS), PARTS THEREOF, OR AIDS AND ACCESSORIES THEREFOR

Patent Classifications

- Subclass = inventions relating to narrower field within the Class.

- For example, subclass 24 relates to PROSTHETICS having ELECTRICAL ACTUATOR

Patent Classifications
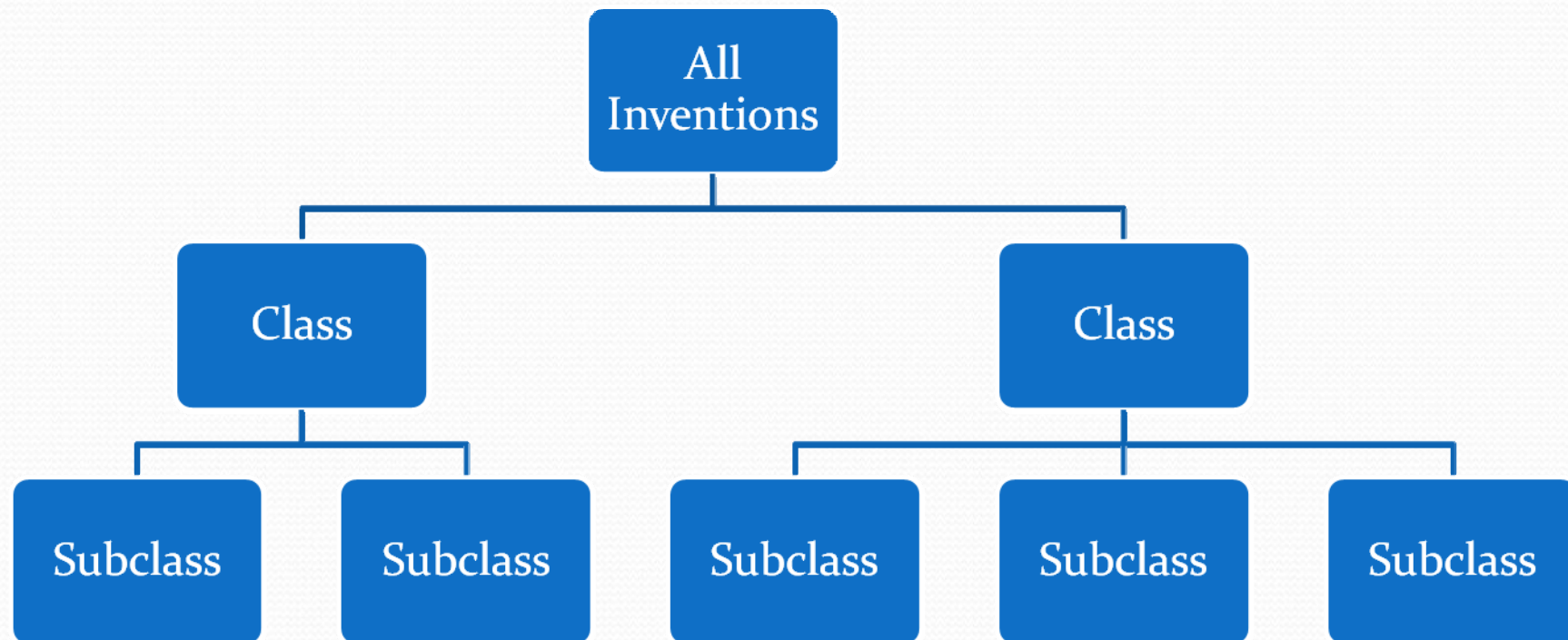
Patent Classifications

WHY ARE CLASS SEARCHES IMPORTANT?

- Patent classification represents a searchable collection of patents grouped together according to similarly claimed subject matter.

- Thus, this search methodology allows one to search for concepts rather than the key words themselves.

- EFFICIENT

- Cleaner Data Set

- Useful in "Mechanical" patents

Core Patent Documents
US4094016A (1978)

Title- Artificial hand and forearm

Relevant Key Features

1. Motorized Prosthetic
2. Mechanically actuated
3. Gripping functionality

Core Patent Documents
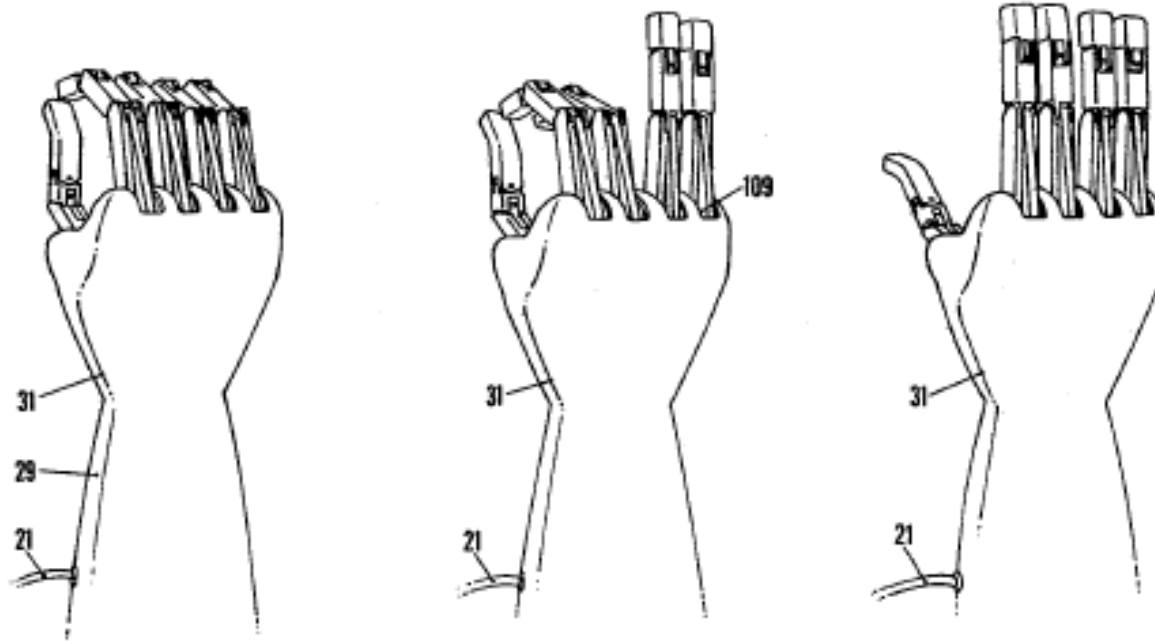## US4094016A (1978)

FIG. 8   FIG. 7   FIG. 6
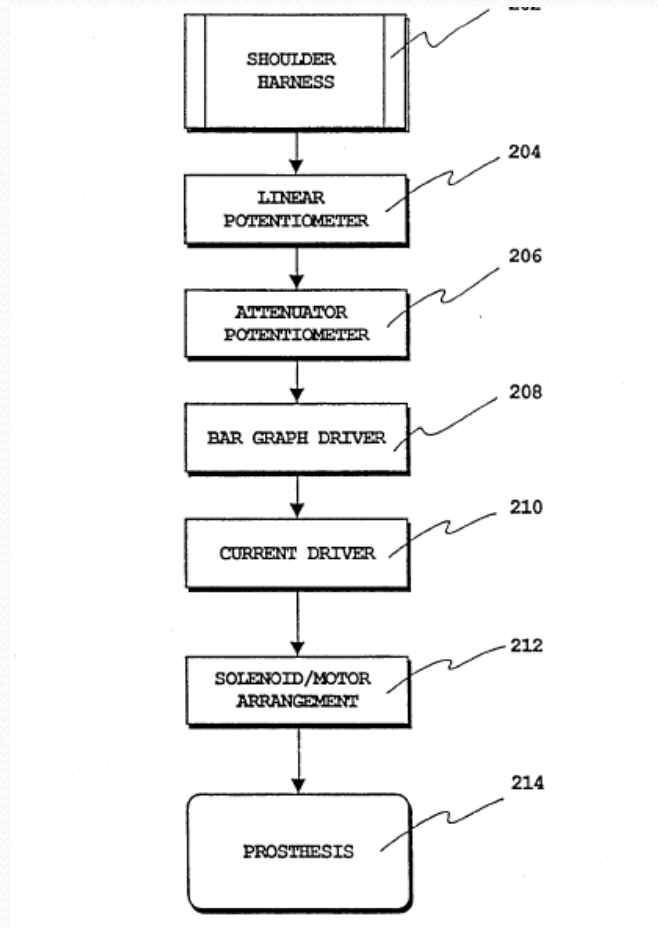
Core Patent Documents
US5480454A (1994)

Title- Control system for prosthetic devices

Key Features

1. Mechanically actuated via the use of "shrug" technique
2. Individual finger digit control for gripping
3. Motor arrangement to reduce actuation force

Core Patent Documents
US5480454A (1994)
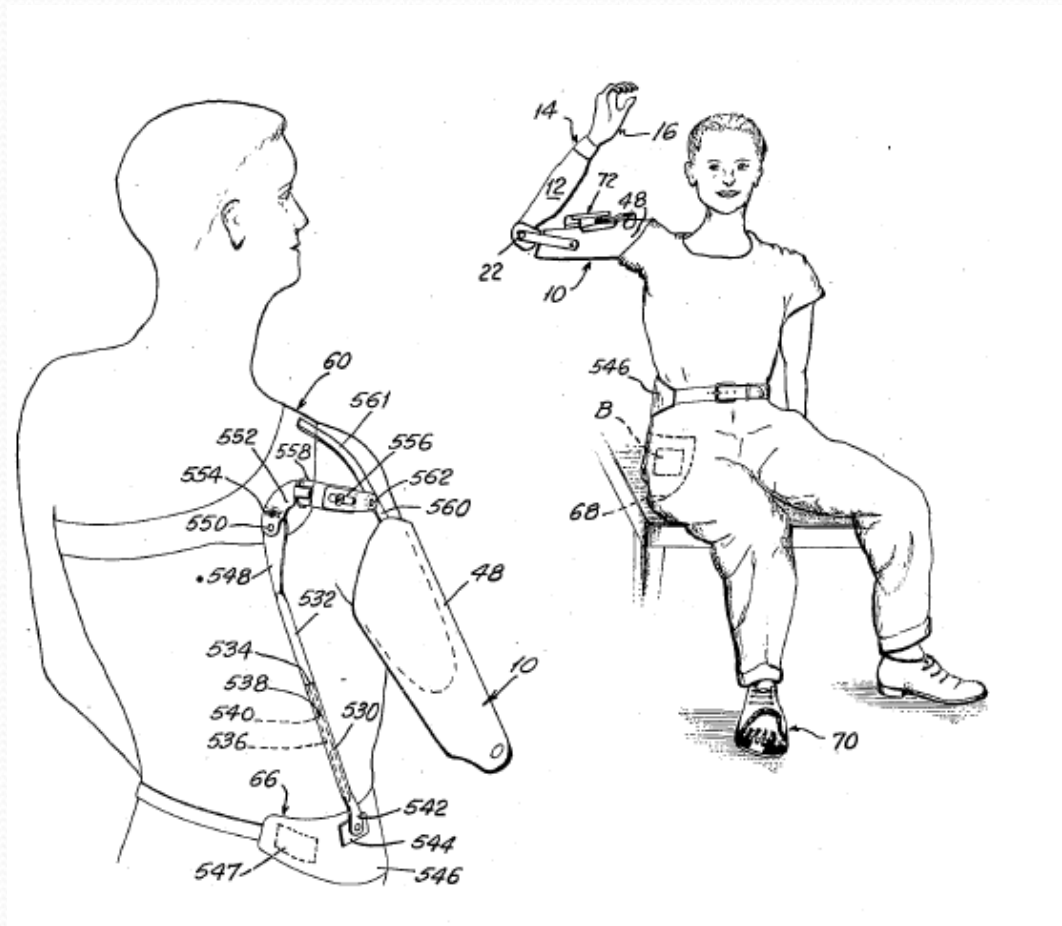
Core Patent Documents US2580987A (1952)

Title- Electrically operated artificial arm for above-the-elbow amputees

Relevant Key features

1. Mechanically Actuated
2. Motion of the arm is accomplished by the power derived from an electric motor, thus relieving the amputee from fatiguing muscular power.
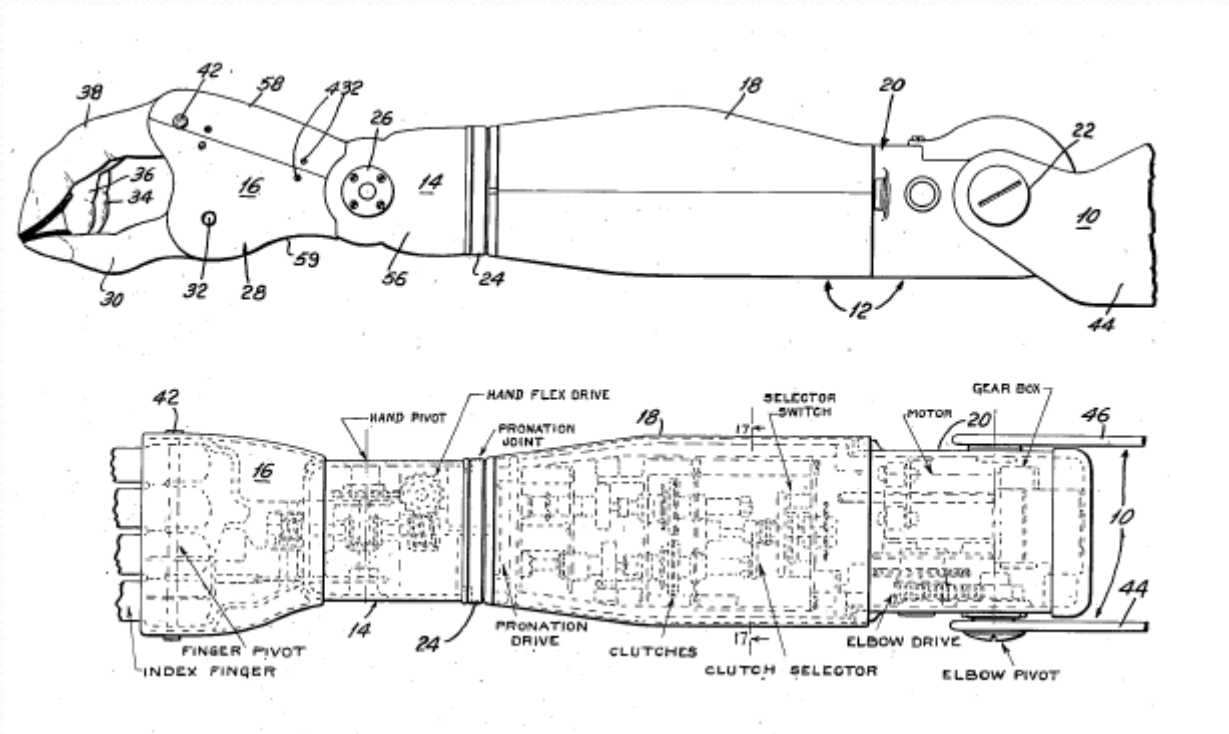3. Fingers capable of independent movement

Core Patent Documents
US2580987A (1952)

Core Patent Documents
US2580987A (1952)
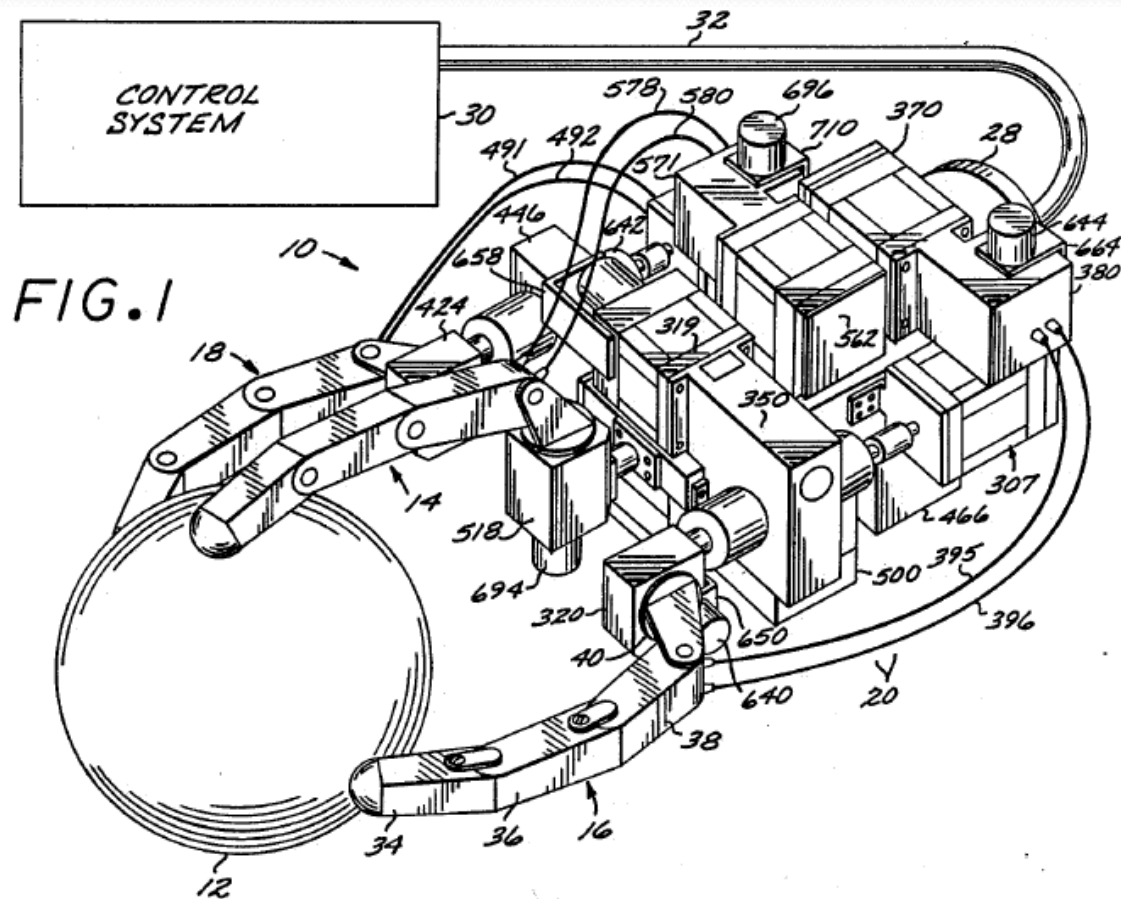
Core Patent Documents US4955918A (1990)

Title- Artificial dexterous hand

Key Features

1. Prosthetic hand containing thumb and fingers for grasping and manipulating objects.
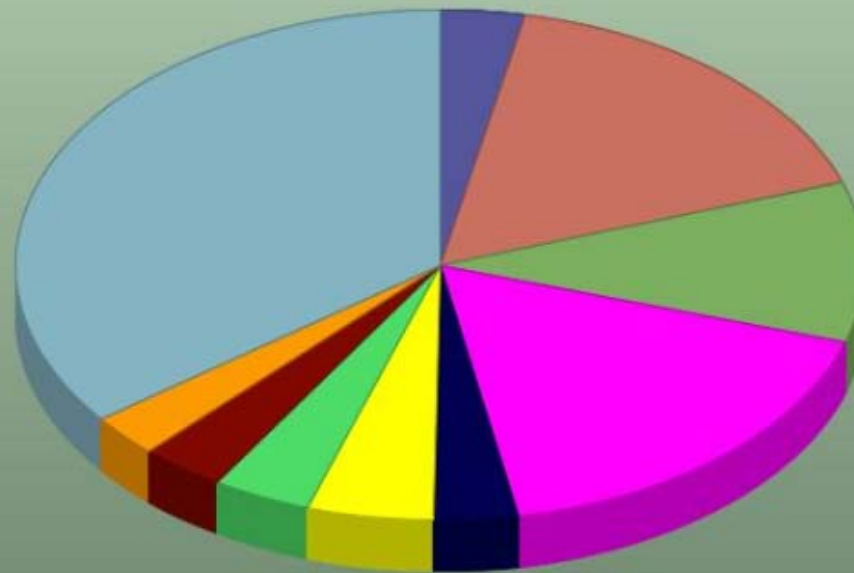2. Mechanically actuated
3. Motorized

Core Patent Documents US4955918A (1990)

FIG.1

CONTROL SYSTEM

Top Assignees

Top Assignees (335 identified prosthetic hand patent families)
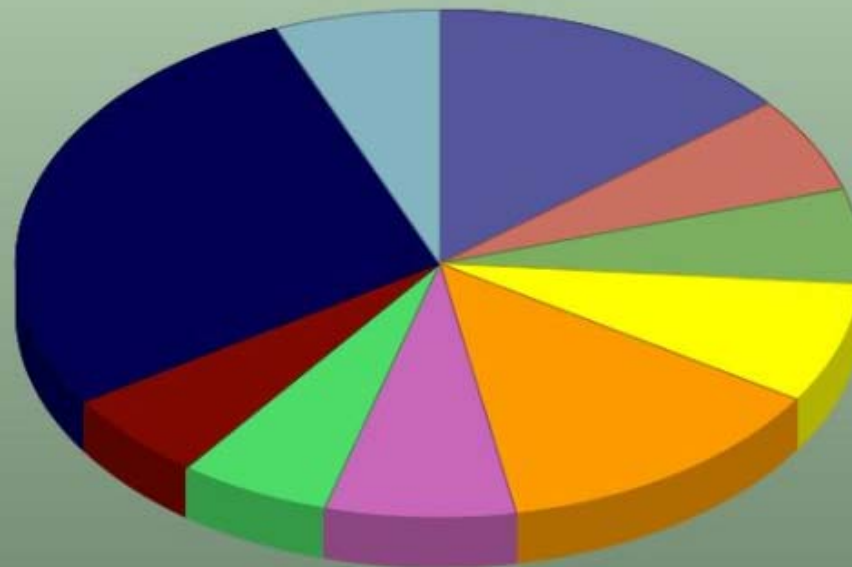
Legend:
- BOCK HEALTHCARE GMBH
- BOCK HEALTHCARE IP GMBH
- BOCK HEALTHCARE LP
- BOCK ORTHOPAED IND
- CASPERS; CARL A
- MOTION CONTROL INC
- OTTO BOCK HEALTHCARE PRODUCTS
- STEEPER HUGH LTD
- US ARMY
- [unspecified]

Source: Thomson Innovation®, www.thomsonscientific.com

Top US Class

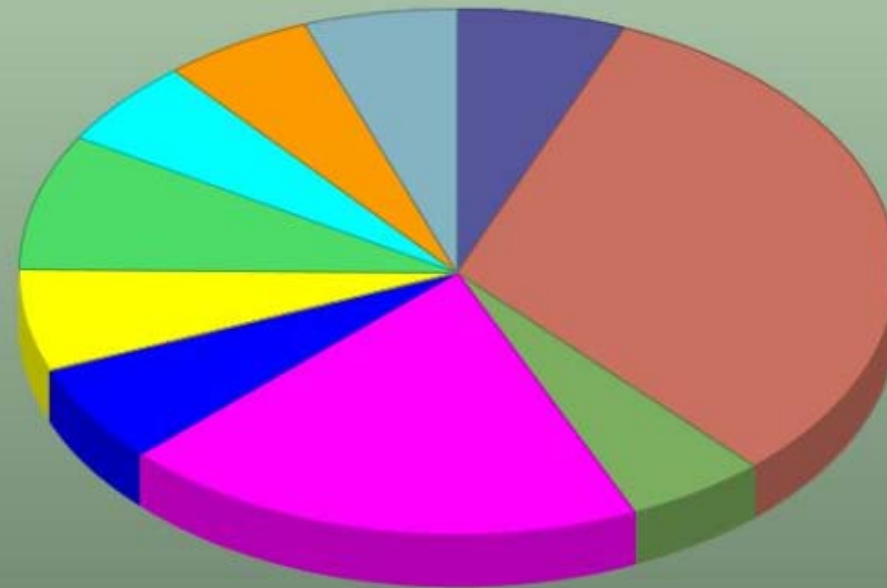Top US Class (335 identified prosthetic hand patent families)

Legend:
- 623024
- 623025
- 623026
- 623057
- 623058
- 623060
- 623062
- 623063
- 623064
- [unspecified]

Source: Thomson Innovation®, www.thomsonscientific.com

Top IPC

Top IPC (335 identified prosthetic hand patent families)

Legend: A61F000200, A61F000250, A61F000254, A61F000258, A61F000260, A61F000268, A61F000270, A61F000272, A61F000276, A61F000280

Source: Thomson Innovation®, www.thomsonscientific.com

Technology Trend Since 1917

Year vs. Number of Applications
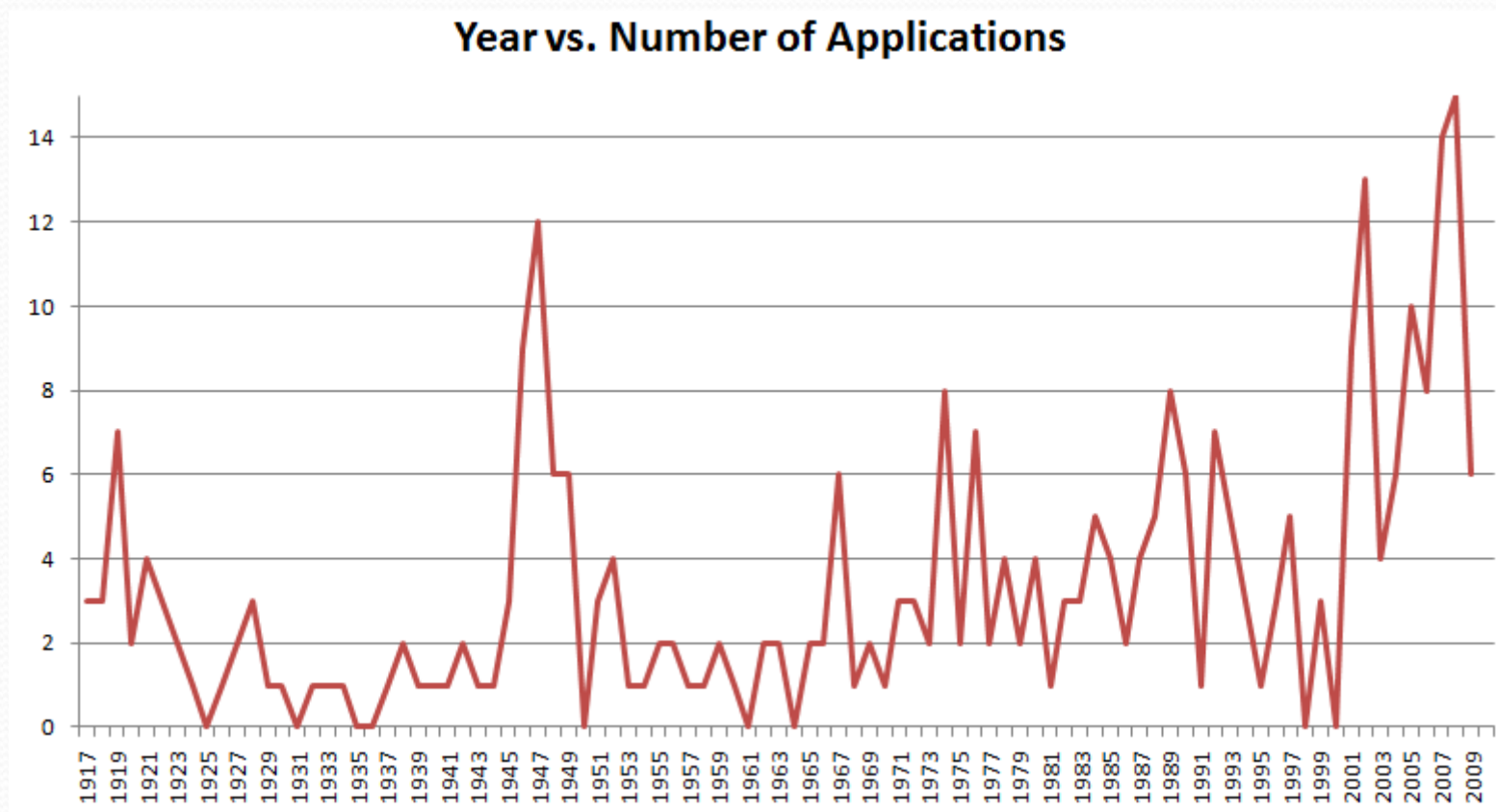
CONCLUSION

1. We analyzed 355 patent families
2. Key features of the technology at hand "appears" to have been described in prior art.
3. For mechanical art, such as prosthetic hands, searches that focused on Classification Codes were effective.
4. Patent documents can be used as a teaching/learning tool for a particular technology.