

Concept Generation

Chapter 7

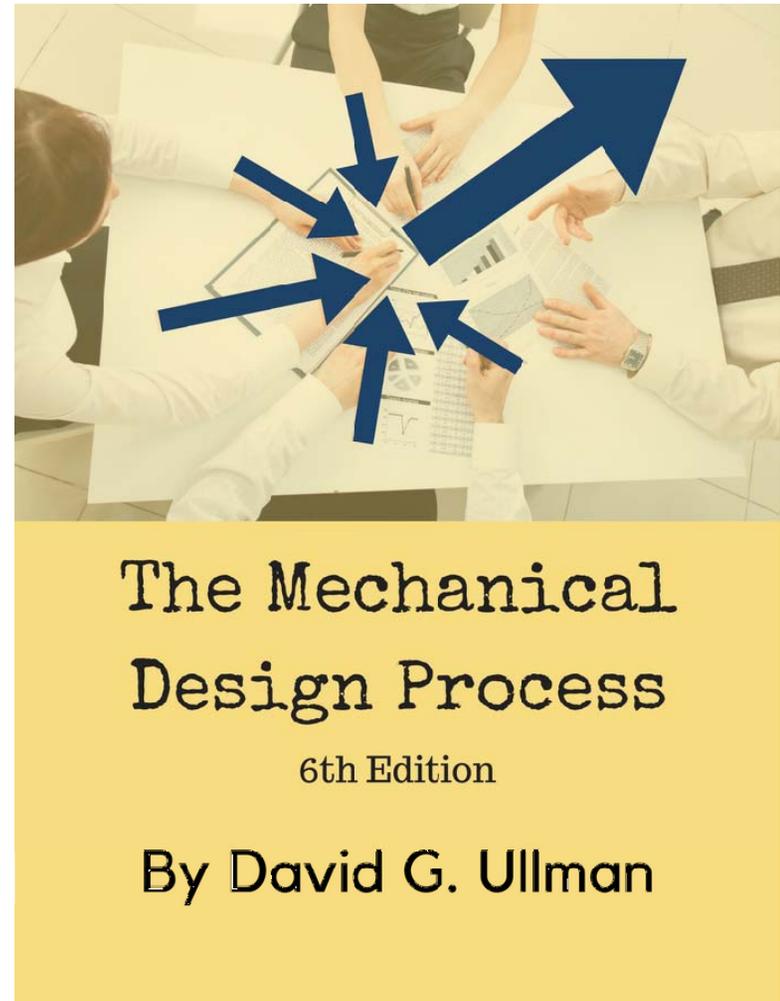


Figure 7.1

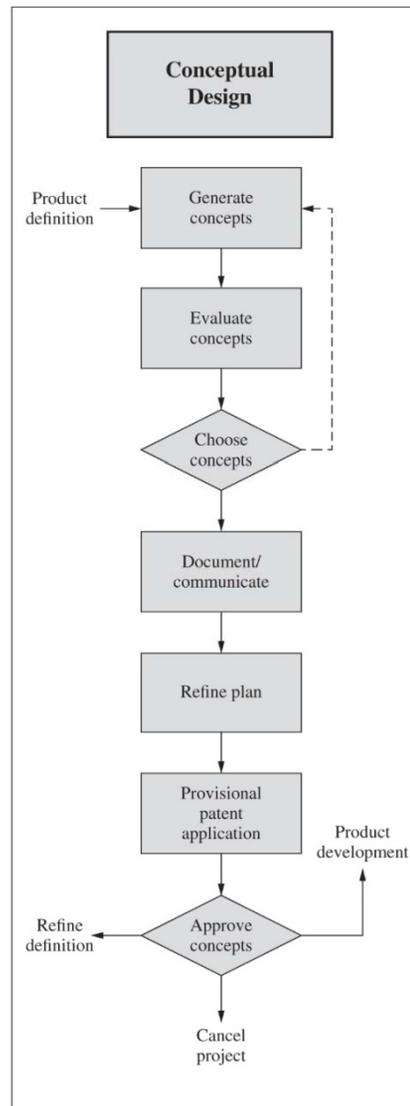
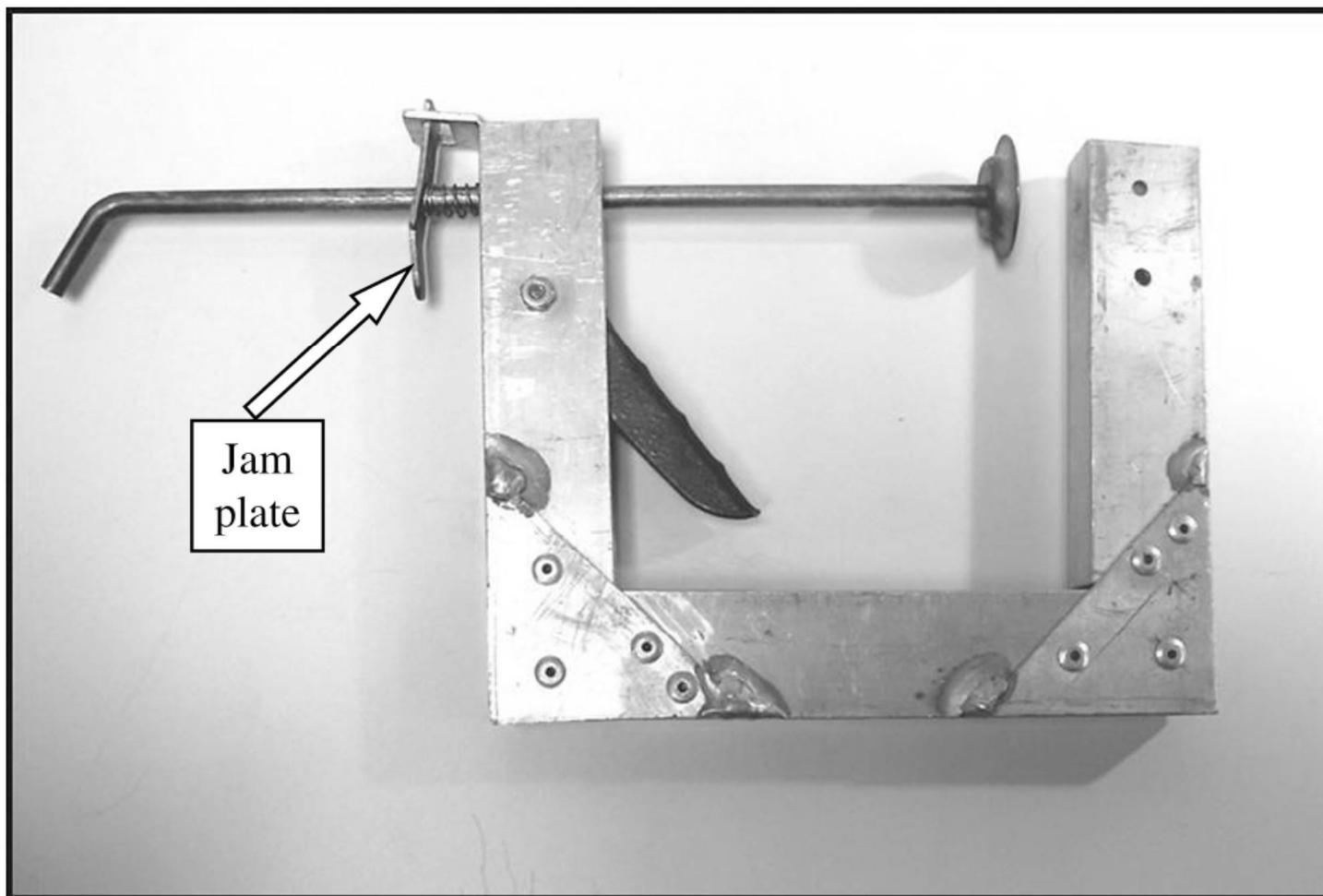


Figure 7.2



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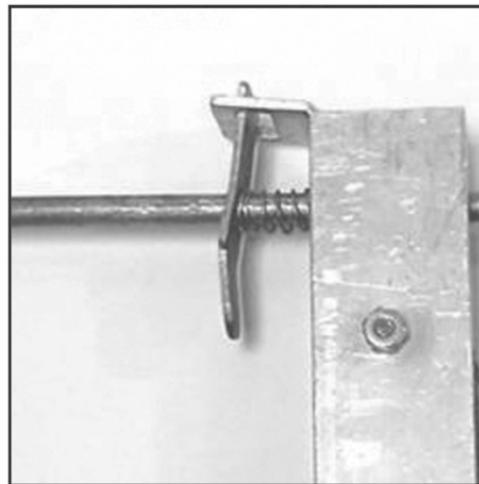
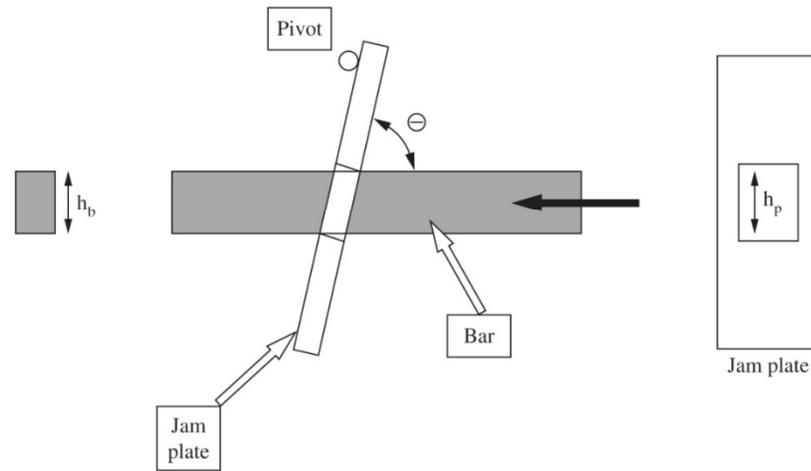


Irwin Industrial Tools



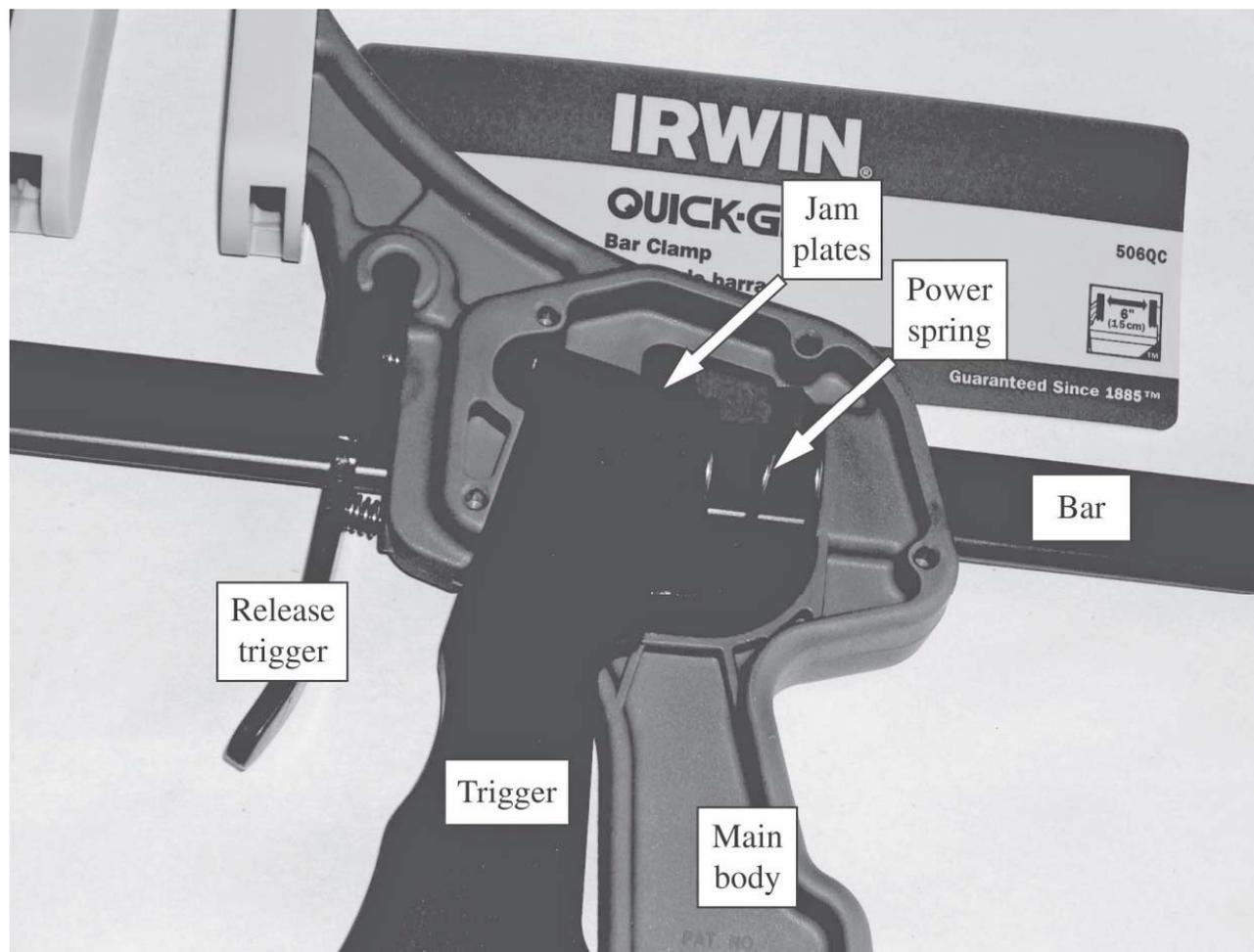
Irwin Industrial Tools

Figure 7.5



Irwin Industrial Tools

Figure 7.6



Irwin Industrial Tools

Figure 7.7

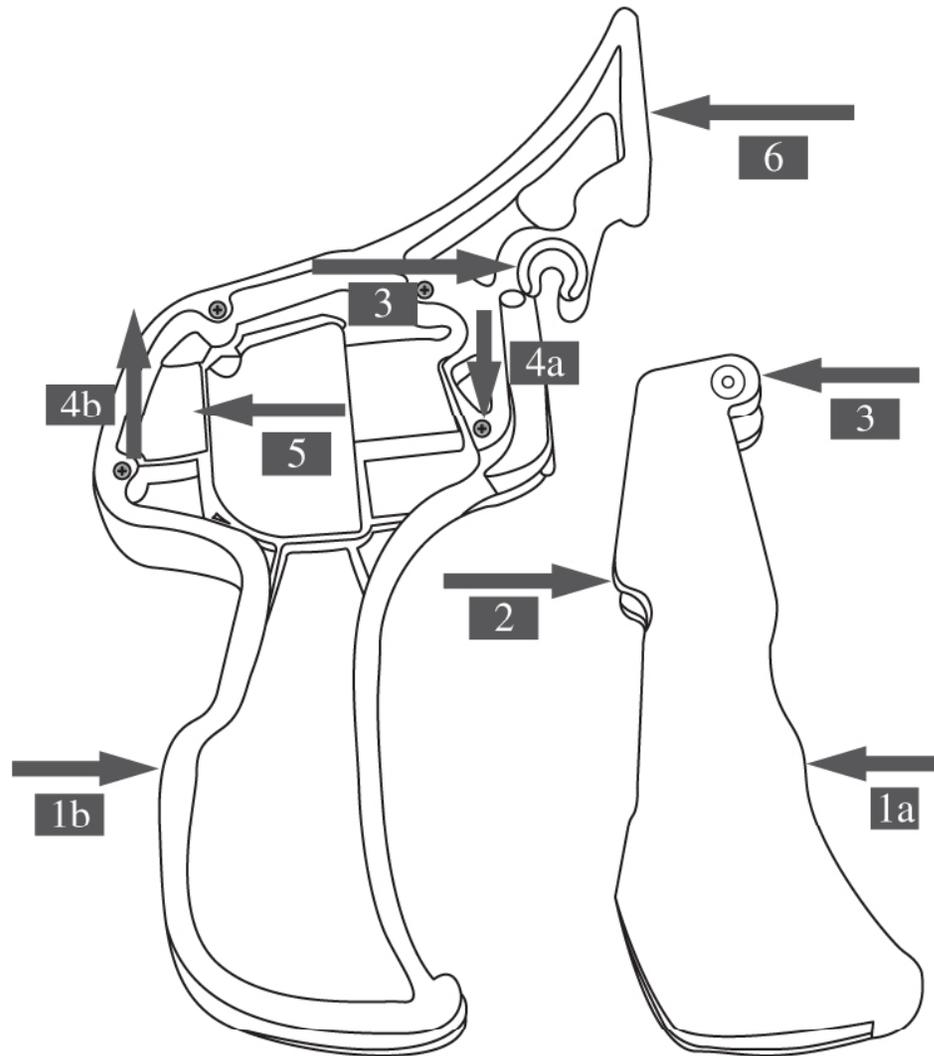


Figure 7.8

Reverse Engineering for Function Understanding					
Design Organization: Example for the Mechanical Design Process				Date: Dec. 20, 2014	
Product Decomposed: Irwin Quick Grip—Pre 2014					
Description: This is the Quick-Grip product that has been on the market for many years.					
How it works: Squeeze the pistol grip repeatedly to move the jaws closer together and increase the clamping force. Squeeze the release trigger to release the clamping force. The foot (the part on the left in the picture that holds the face that is clamped against) is reversible so the clamping force can be made to push apart rather than squeeze together.					
Interfaces with other objects:					
Part #	Part Name	Other Object	Energy Flow	Information Flow	Material Flow
1 & 2	Main body and Trigger	User's hand	User squeezes trigger to move jaws closer together and	Squeezing force proportional to jaw force	User's hand grips and releases
8	Pad	Parts being clamped	Clamping force and compressive motion of jaws moving together	None	Parts flow into and out of jaws
Etc.					
Flow of energy, information, and materials:					
Part #	Part Name	Interface Part #	Flow of Energy, Information, and Material	Image	
1	Trigger	User	Force 1a applied by gripping trigger and main body. Resistance force felt by user proportional to clamping force.		
2	Trigger	1—Main body	Force 3 at pivot—reaction force		
3	Trigger	14—Jam plate	Force 2 pushes on the jam plate to ultimately make the bar move and apply the clamping force.		
4	Etc.				
Links and drawing files:					
Team member:			Prepared by:		
Team member:			Checked by:		
Team member:			Approved by:		
Team member:					
The Mechanical Design Process			Designed by Professor David G. Ullman		
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Table 7.1 Typical mechanical design functions

Absorb/remove	Dissipate	Release
Actuate	Drive	Rectify
Amplify	Hold or fasten	Rotate
Assemble/disassemble	Increase/decrease	Secure
Change	Interrupt	Shield
Channel or guide	Join/separate	Start/stop
Clear or avoid	Lift	Steer
Collect	Limit	Store
Conduct	Locate	Supply
Control	Move	Support
Convert	Orient	Transform
Couple/interrupt	Position	Translate
Direct	Protect	Verify

Figure 7.9

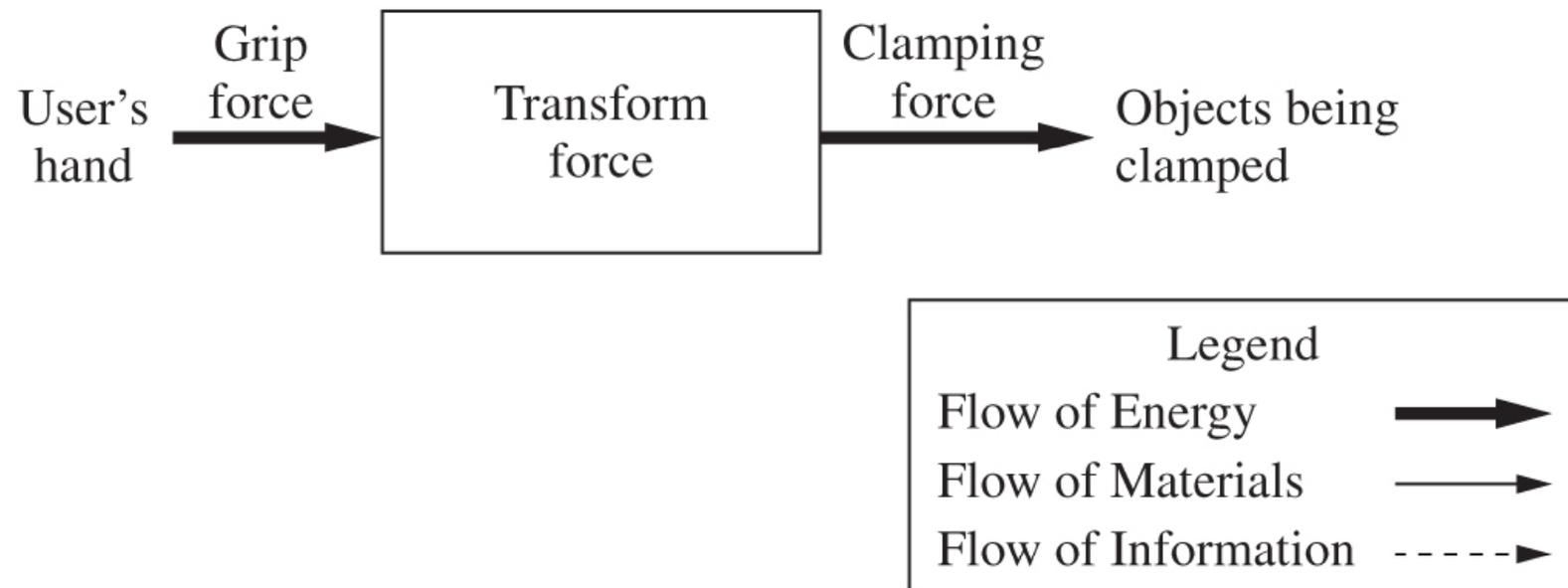


Figure 7.10



GE Medical

Figure 7.11

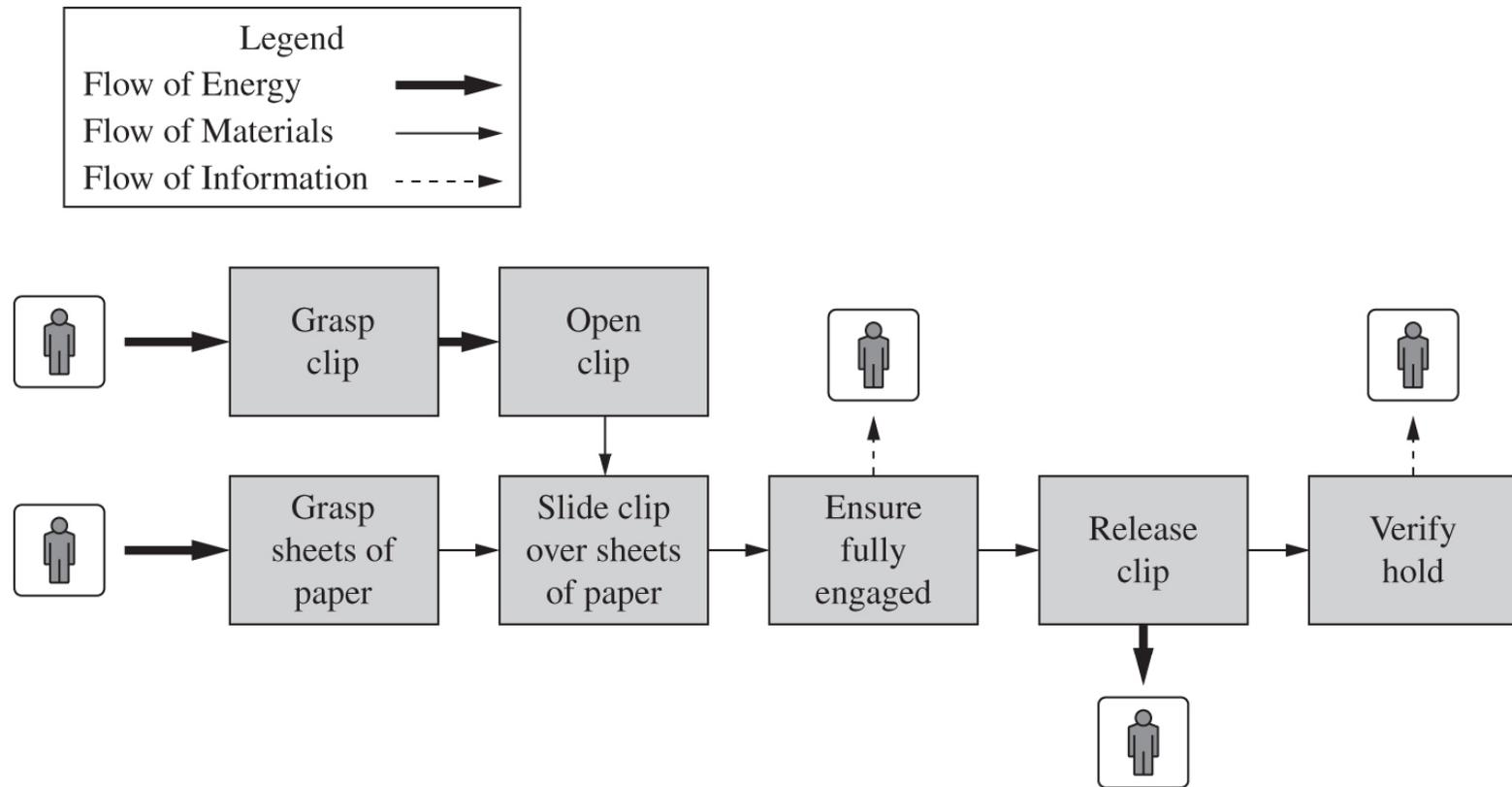


Figure 7.12

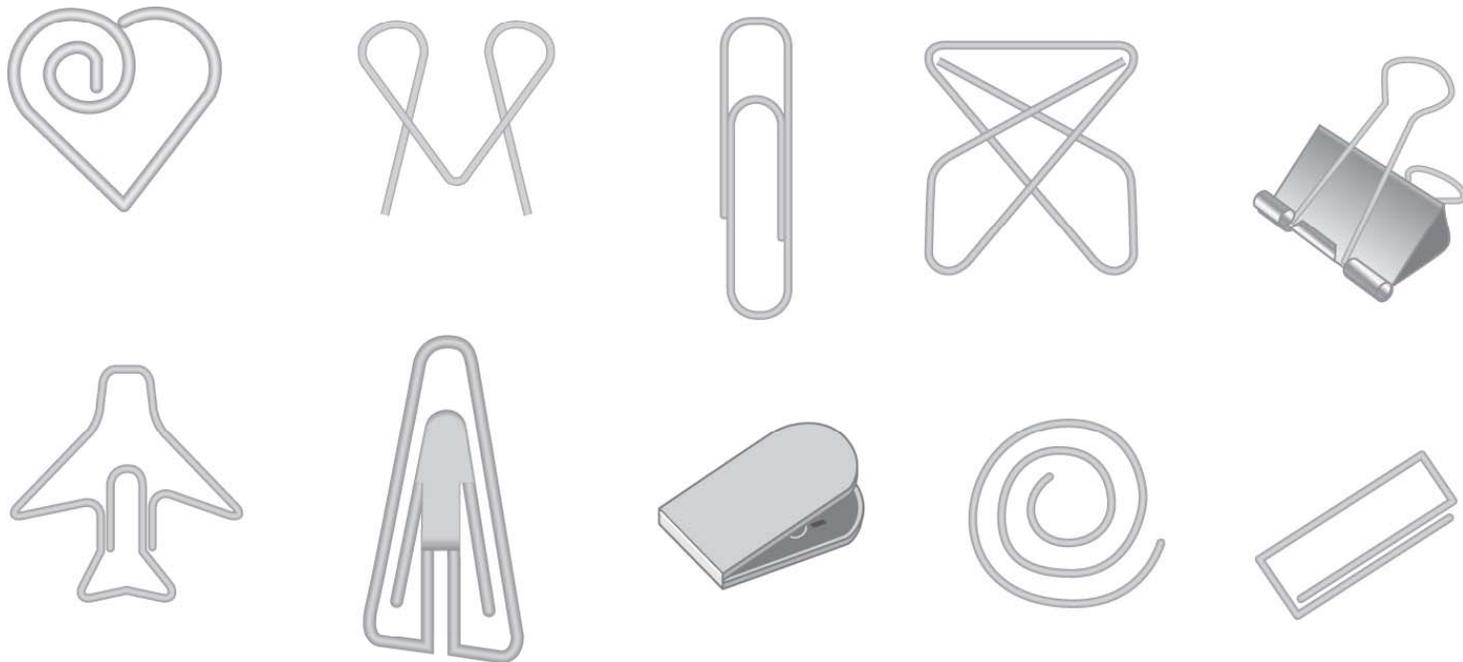


Figure 7.13

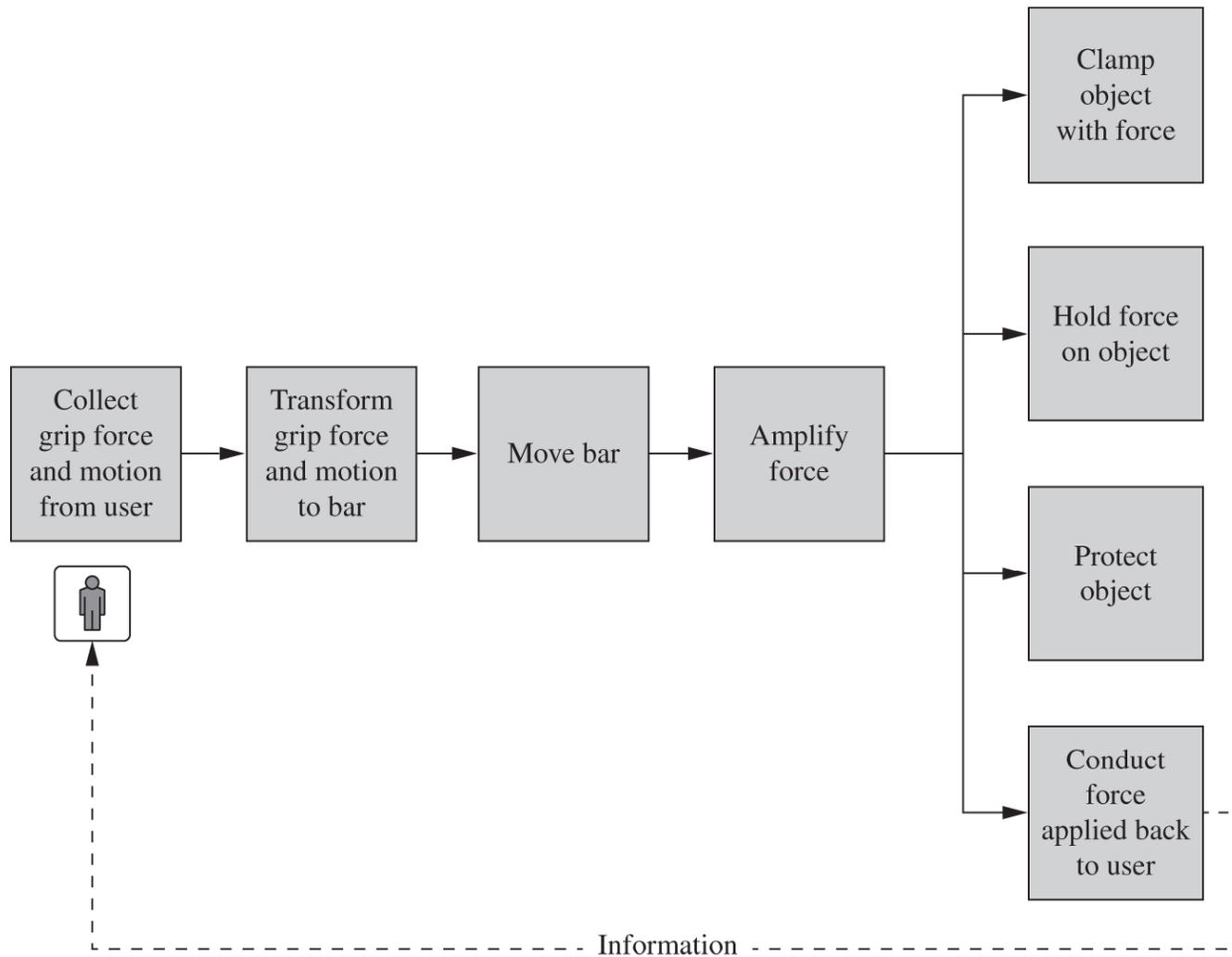


Figure 7.14

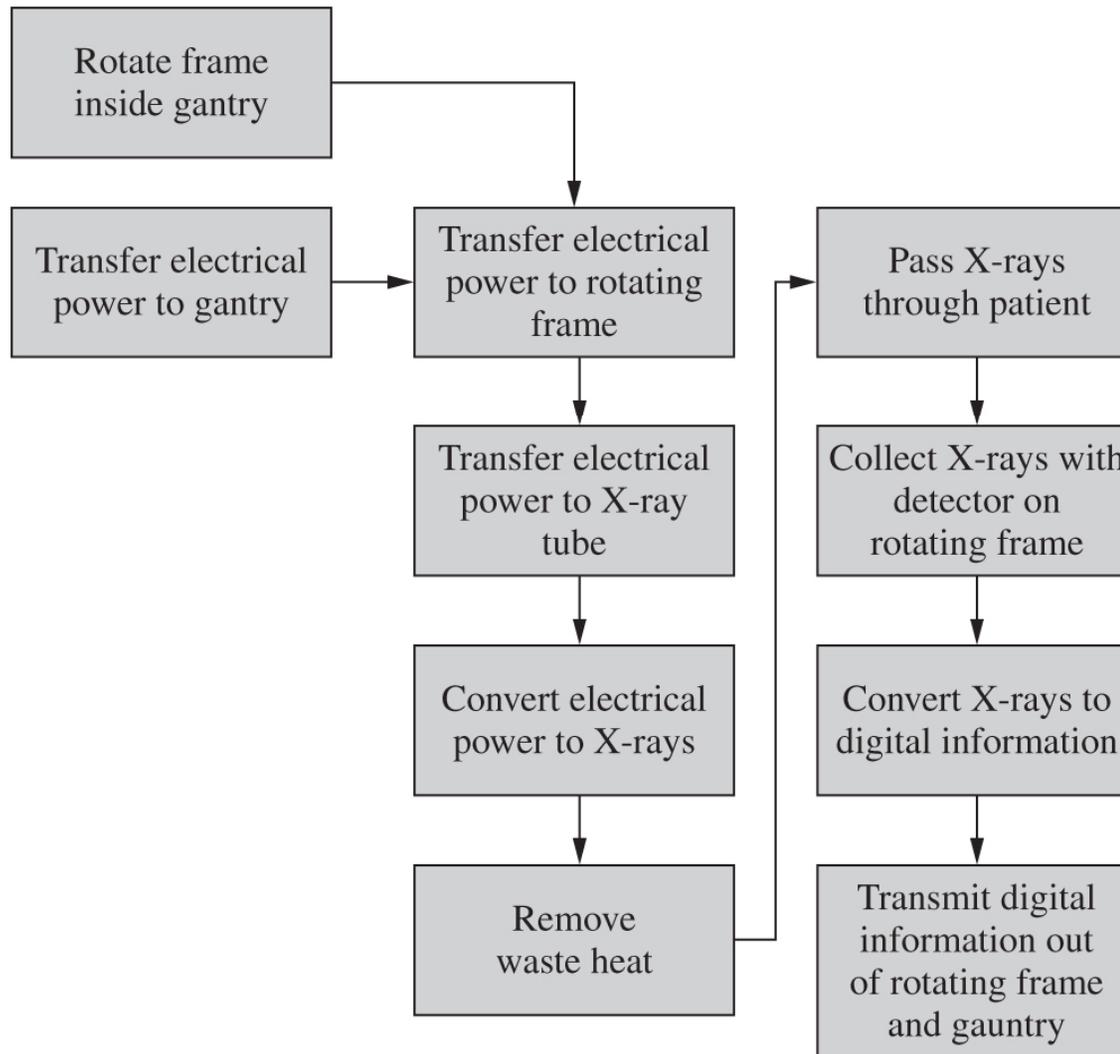
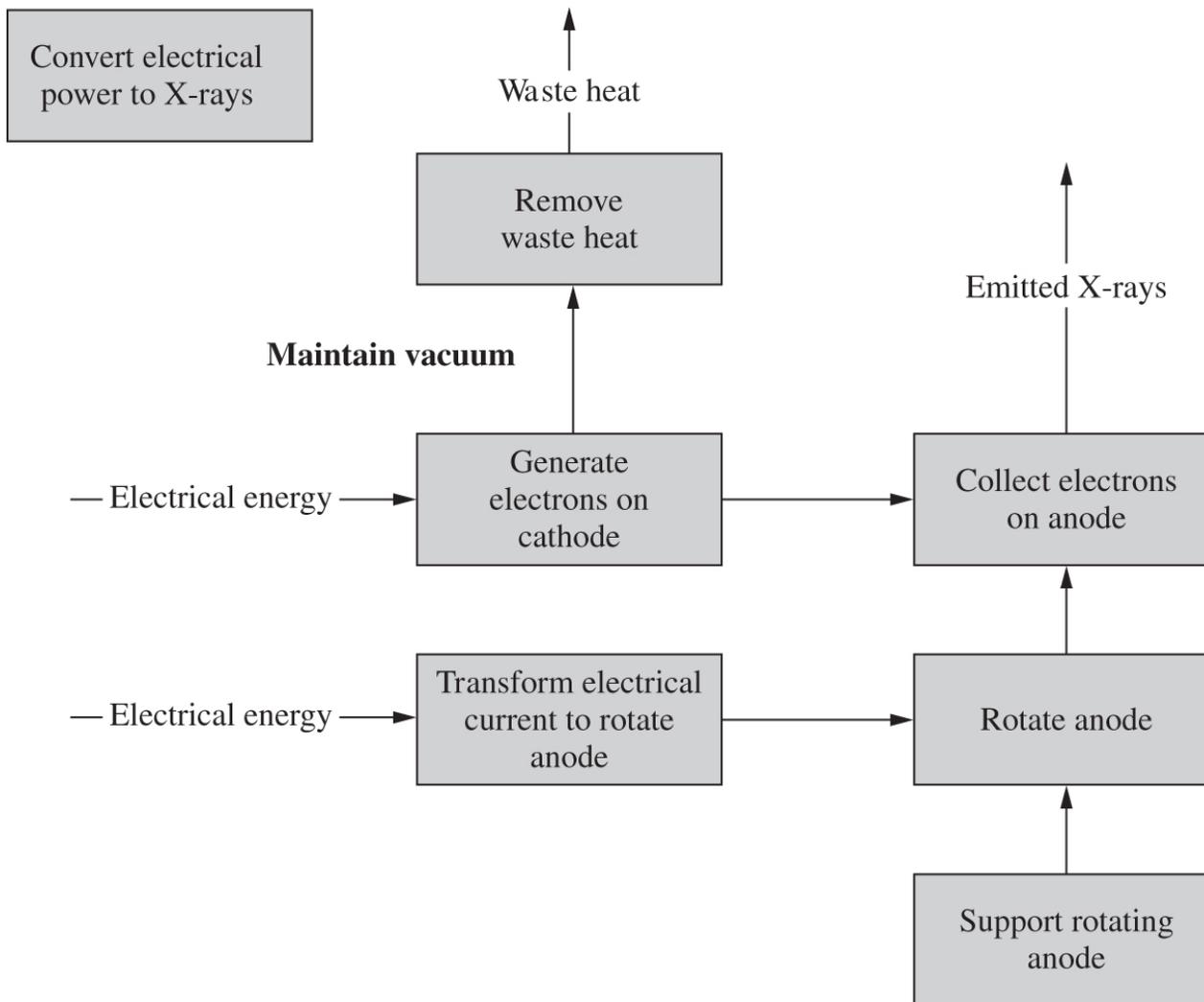


Figure 7.15





“It’s our new assembly line. When the person at the end of the line has an idea, he puts it on the conveyor belt, and as it passes each of us, we mull it over and try to add to it.”

Figure 7.17

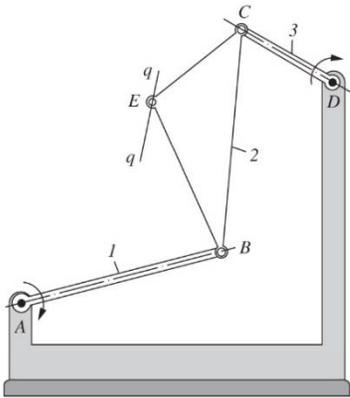
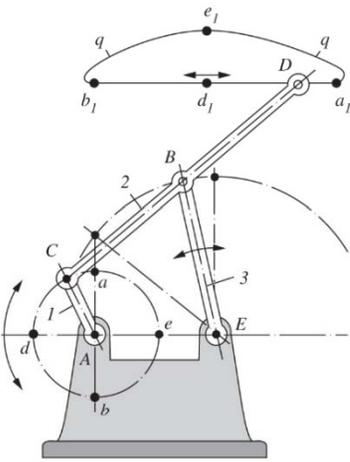
650	WATT FOUR-BAR APPROXIMATE STRAIGHT-LINE MECHANISM	LW GI
 <p data-bbox="1150 358 1377 565">The lengths of the links of four-bar linkage $ABCD$ comply with the conditions: $\overline{AD} = 1.84\overline{AB}$, $\overline{BE} = 0.76\overline{AB}$, $\overline{BC} = 1.03\overline{AB}$, $\overline{EC} = 0.55\overline{AB}$, and $\overline{DC} = 0.52\overline{AB}$. When link 1 turns about fixed axis A, point E of link 2 describes a path of which portion $q-q$ is approximately a straight line.</p>		
651	CHEBYSHEV FOUR-BAR APPROXIMATE STRAIGHT-LINE MECHANISM	LW GI
 <p data-bbox="1150 911 1377 1133">The lengths of the links of four-bar linkage $ABCD$ comply with the conditions: $\overline{CB} = \overline{BE} = \overline{BD} = 2.5\overline{AC}$ and $\overline{AE} = 2\overline{AC}$. When link 1 rotates about fixed axis A, point D of link 2 describes path $q-q$. Upon motion of point C along arc $a-d-b$, point D travels along approximately straight line $a_1-d_1-b_1$.</p>		

Figure 7.18

United States Patent [19] [11] **Patent Number:** 5,009,134
Sorensen et al. [45] **Date of Patent:** * Apr. 23, 1991

[54] **QUICK-ACTION BAR CLAMP**

[75] **Inventors:** Joseph A. Sorensen; Dwight L. Gatzmeyer, both of Lincoln, Nebr.

[73] **Assignee:** Petersen Manufacturing Co., Inc.

[*] **Notice:** The portion of the term of this patent subsequent to May 22, 2007 has been disclaimed.

[21] **Appl. No.:** 480,283

[22] **Filed:** Feb. 15, 1990

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 234,173, Aug. 19, 1988, Pat. No. 4,926,722.

[51] **Int. Cl.⁵** B25B 5/02

[52] **U.S. Cl.** 81/487; 269/6; 269/166; 269/169; 269/88

[58] **Field of Search** 81/487, 126; 269/166, 269/167, 170, 169, 165, 6, 203, 204, 88; 29/239

[56] **References Cited**

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Primary Examiner—Roscoe V. Parker
Attorney, Agent, or Firm—Lackebach Siegel Marzullo & Aronson

[57] **ABSTRACT**

A bar clamp having a fixed jaw and a movable jaw which is radially movable over both short and long distances to clamp against a workpiece and is operable using one hand with complete control by the operator at all times. The jaws may either face one another while being mounted on the same side of a handle/grip assembly or face in opposite directions while being mounted on opposite sides of the handle/grip assembly whereby they may be incrementally advanced by the trigger handle/driving lever.

8 Claims, 8 Drawing Sheets

Figure 7.19

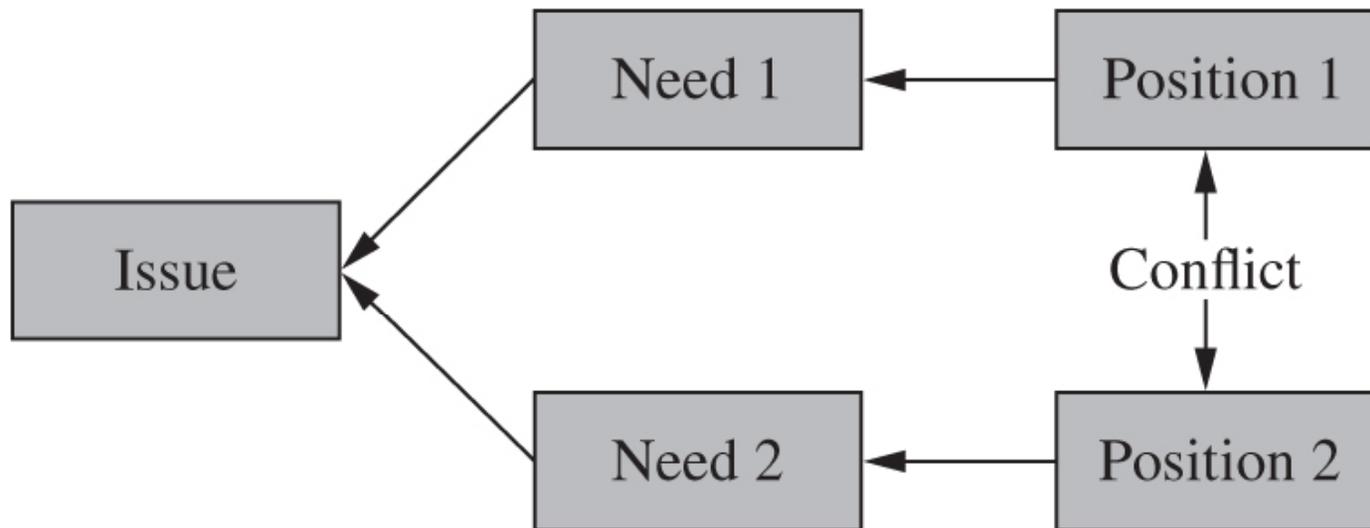


Figure 7.20

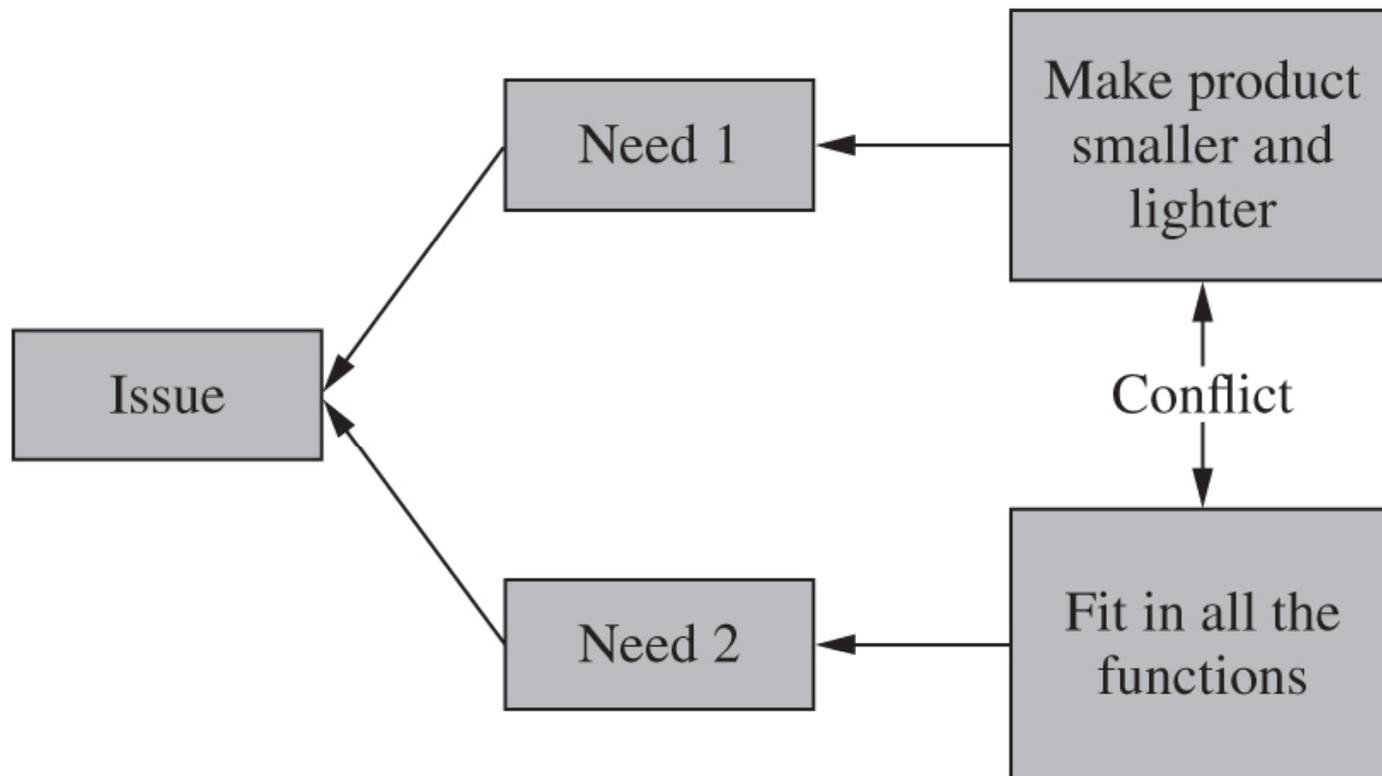


Figure 7.21

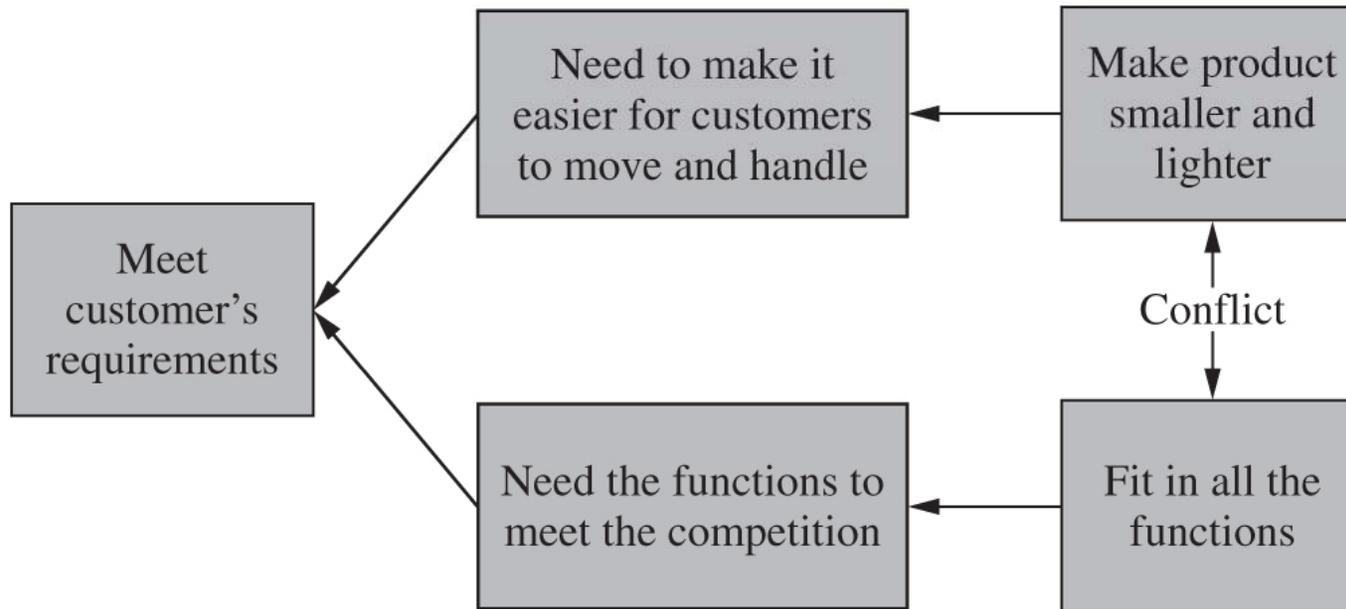


Figure 7.22

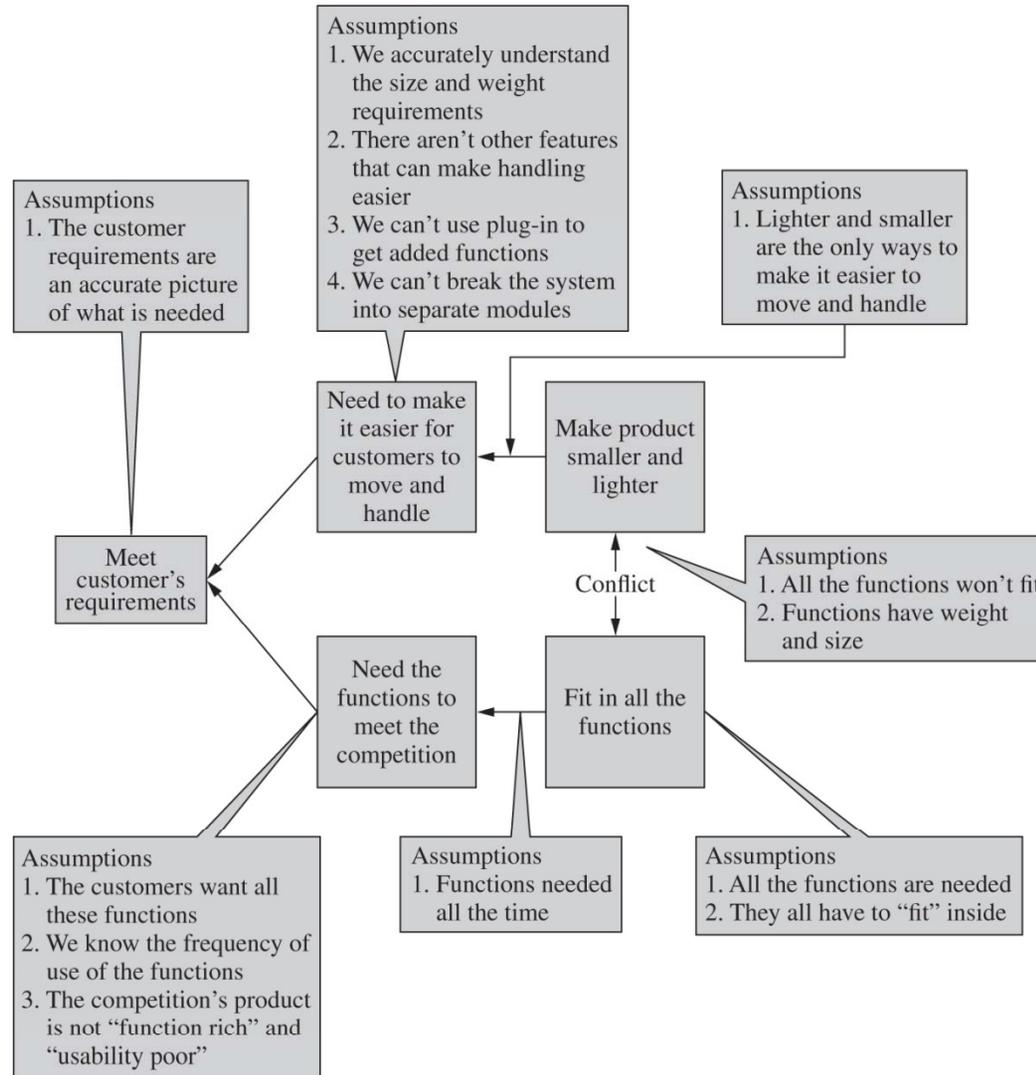


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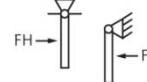
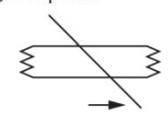
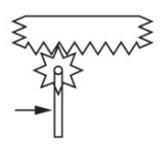
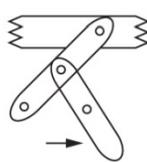
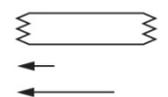
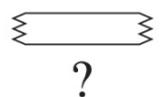
Morphology				
Product: One-handed bar clamp			Organization Name: Irwin Tools	
Subfunctions	Concept 1	Concept 2	Concept 3	Concept 4
Collect grip force and motion from user	One trigger 	Two triggers 		
Transform grip force and motion to bar	Jam plate 	Ratchet 	Rack and pinion 	Linkage 
Move bar	Free sliding 	2 speed system 	> 2 speed system ? 	
Amplify force	Short stroke 	Long stroke 		
Team Member: <i>D/P</i>	Team Member:	Prepared by: <i>D/P</i>		
Team Member: <i>A/Q</i>	Team Member:	Checked by: <i>A/Q</i>	Approved by:	
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Figure 7.24

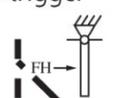
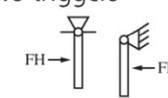
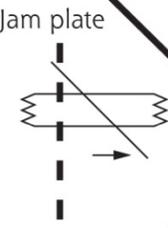
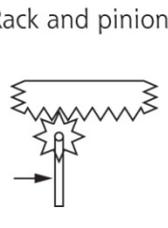
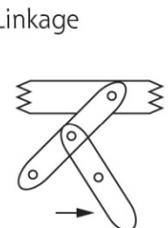
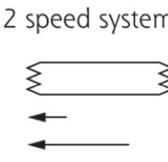
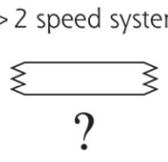
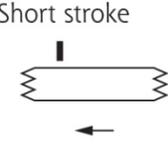
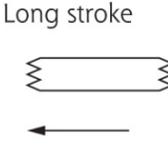
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Amplify force	Short stroke 	Long stroke 		
Team Member: <i>DIP</i>	Team Member:	Prepared by: <i>DIP</i>		
Team Member: <i>AQ</i>	Team Member:	Checked by: <i>AQ</i>	Approved by:	
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Figure 7.25

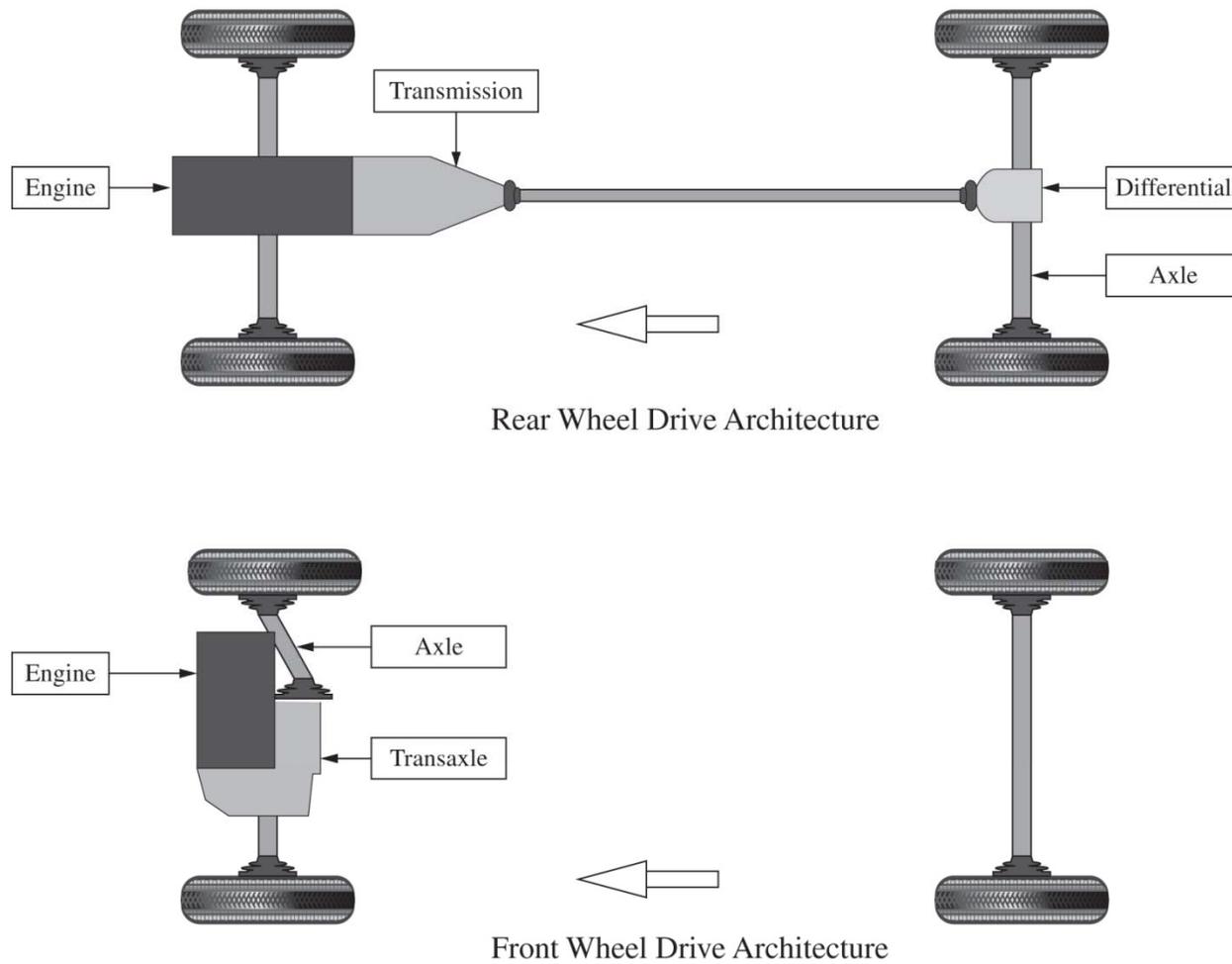
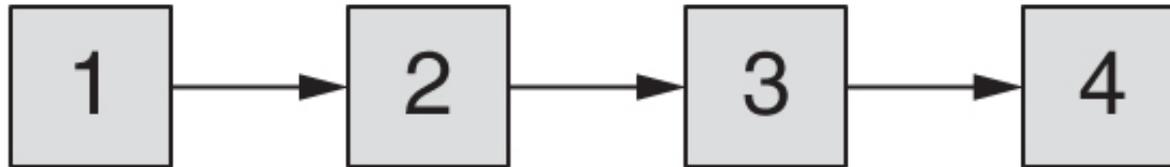
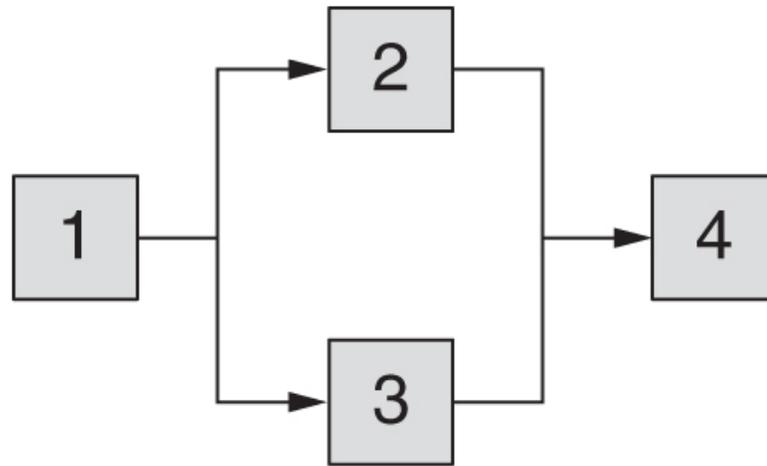


Figure 7.26



	1	2	3	4
1	1	●		
2		2	●	
3			3	●
4				4

Figure 7.27



	1	2	3	4
1	1	●	●	
2		2		●
3			3	●
4				4

Figure 7.28

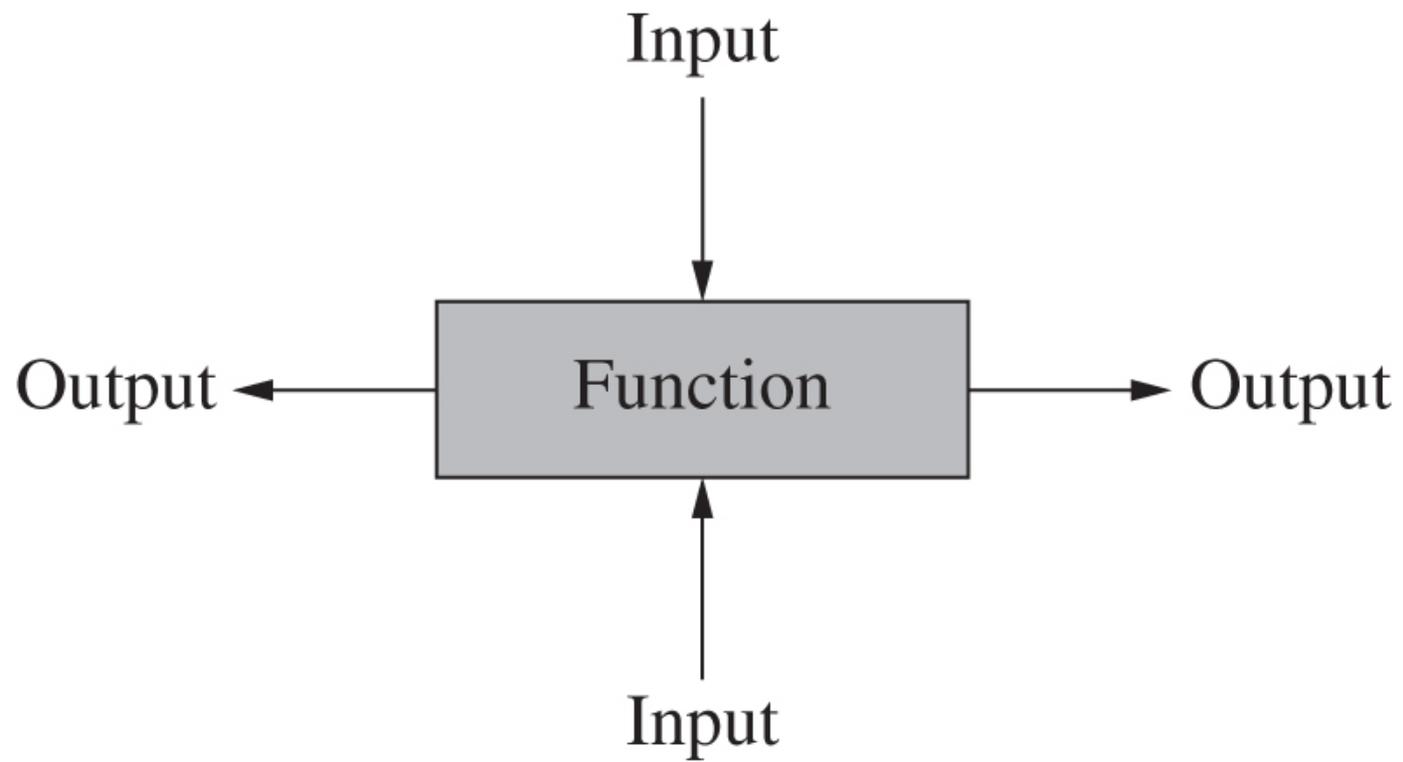
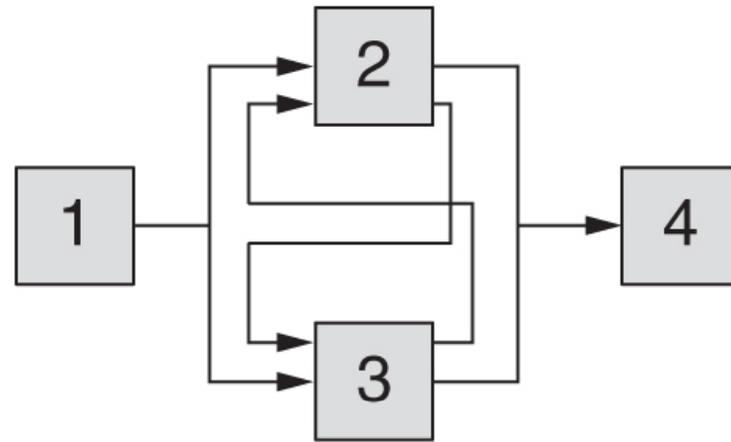


Figure 7.29



	1	2	3	4
1	1	●	●	
2		2	●	●
3		●	3	●
4				4

Figure 7.30

ID	Name		1	2	3	4	5	6	7	8	9	10
1	Store Fuel	1	1	●								
2	Convert Fuel to Mechanical Energy	2		2			●					
3	Store Electrical Energy	3			3	●			●			
4	Convert Electrical Energy to Mechanical	4				4	●	●				
5	Merge Mechanical Energy	5					5					●
6	Sense Electrical/Mechanical Contribution	6						6	●	●		
7	Control Electrical Conversion	7				●			7			
8	Control Mechanical Conversion	8		●						8		
9	Sense Torque need	9						●			9	
10	Transmit Torque to Wheels	10									●	10

Figure 7.31

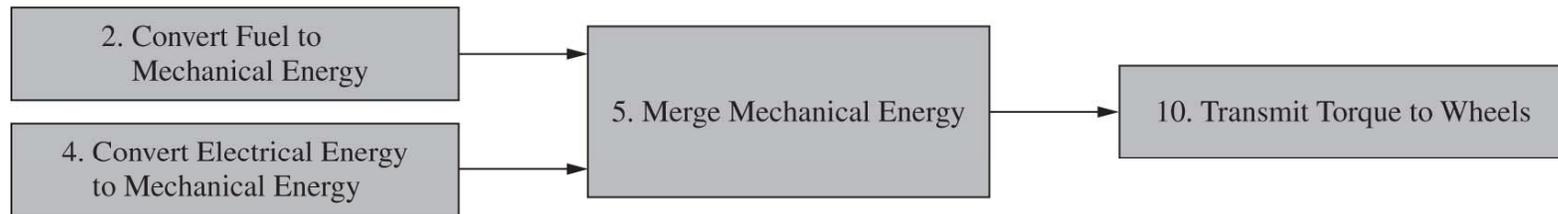


Figure 7.32

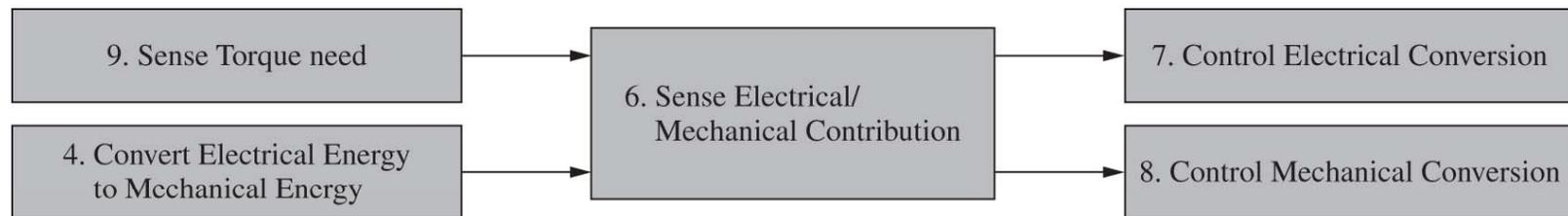


Figure 7.33

		Store Fuel	Convert Fuel into Mechanical Energy	Merge Mechanical Energy	Transmit Torque to Wheels	Sense Torque Need	Control Mechanical Conversion	Store Electrical Energy	Convert Electrical Energy to Mechanical	Sense Electrical/Mechanical Contribution	Control Electrical Conversion
1	Store Fuel	1	●								
2	Convert Fuel into Mechanical Energy		2	●							
5	Merge Mechanical Energy		●	5	●						
10	Transmit Torque to Wheels				10	●					
9	Sense Torque Need					9				●	
8	Control Mechanical Conversion		●				8				
3	Store Electrical Energy						●	3	●		
4	Convert Electrical Energy to Mechanical			●					4	●	
6	Sense Electrical/Mechanical Contribution						●			6	●
7	Control Electrical Conversion							●			7

Figure 7.34

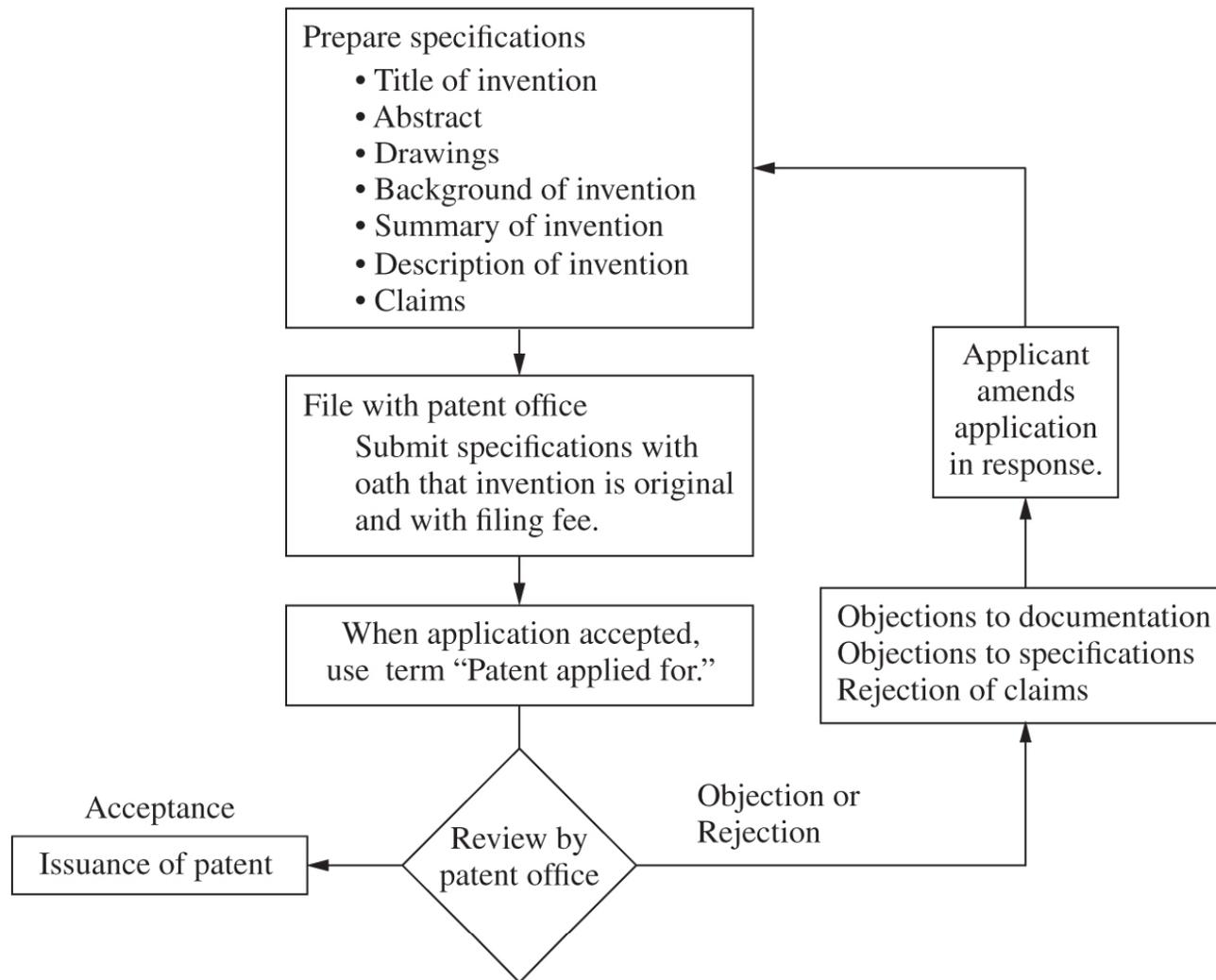


Figure 7.35

Patent Specification	
Design Organization:	Date:
Title of Invention:	
Abstract:	
Background of the Invention:	
Summary of the Invention:	
Description of Drawings:	
Claims:	
Attach drawings as needed	
Notes about filing with the patent office:	Team member:
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	Team member:
	Team member:
	Prepared by:
	Checked by:
	Witnessed by:
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