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Graph-based patent search

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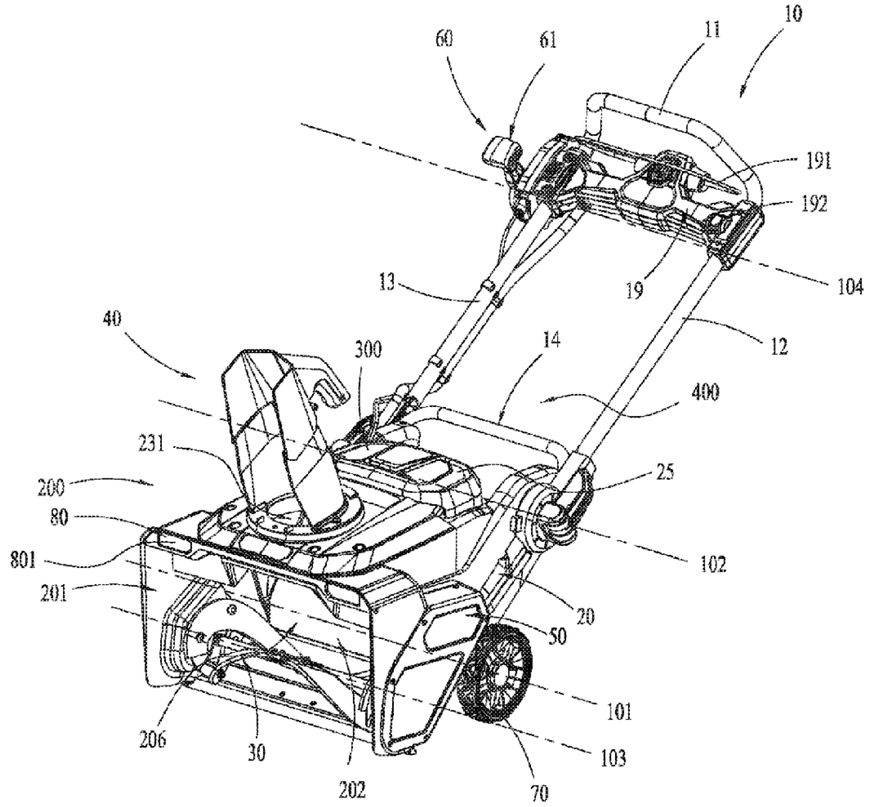
The insight: concept graph

A snowthrower comprising a motor, an auger driven by the motor to rotate, a handle device for a user to operate, an auger housing for containing the auger and a frame for connecting the handle device and the auger housing, wherein the auger housing is made of at least two different materials.

- snowthrower
  - motor
  - handle device
    - **handle device** for a user to operate
  - auger housing
    - auger
      - **auger** driven by **motor** to rotate
    - at least two different materials
  - frame
    - **frame** for connecting **handle device** and **auger housing**



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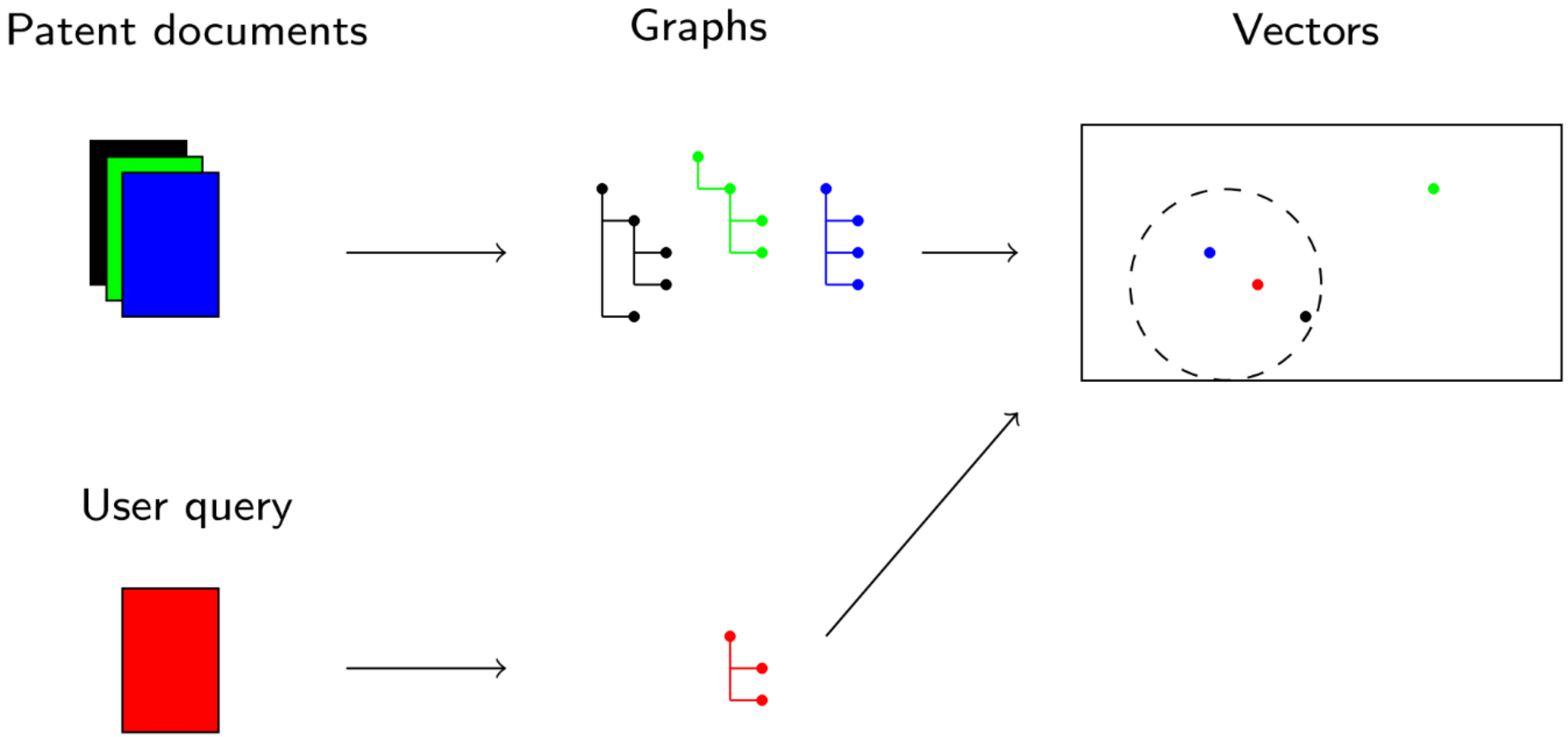
Graph motivation

- With graph, no repetition or jargon is needed
- Explainable
- Encodes information into the structure
- Can connect with other data

The solution - divide and conquer



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Document → graph

1. A snowthrower, comprising:

a motor;

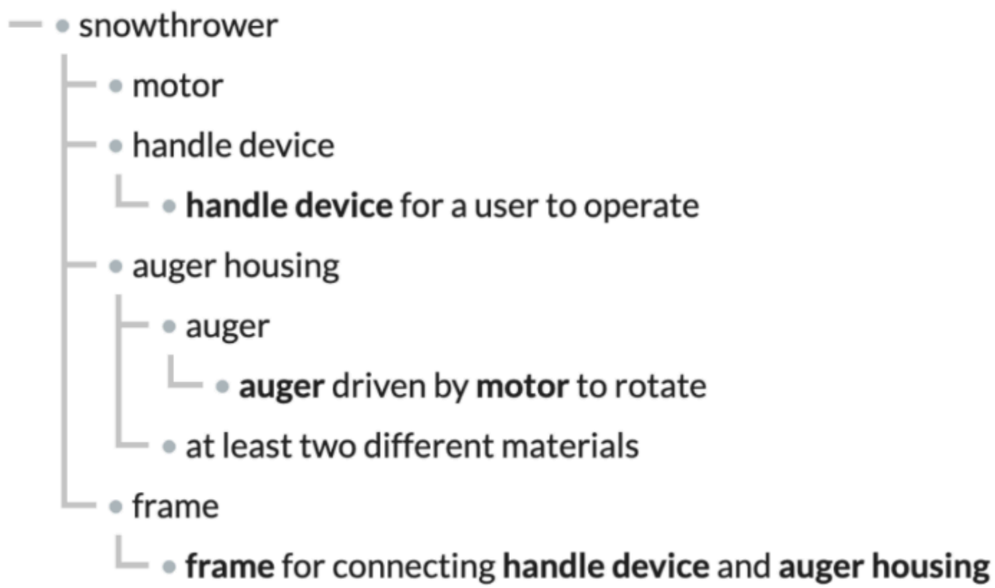
an auger driven by the motor to rotate;

a handle device for a user to operate;

an auger housing for containing the auger; and

a frame for connecting the handle device and the auger housing;

wherein the auger housing is made of at least two different materials.



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Seeking to cover everything

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Supervised training

X/Y/A citations

- snowthrower
  - motor
  - handle device
    - **handle device** for a user to operate
  - auger housing
    - auger
      - **auger** driven by **motor** to rotate
    - at least two different materials
  - frame
    - **frame** for connecting **handle device** and **auger housing**

- snow thrower
  - transmission adjustable auger housing system
    - sweeping system
      - scraper bar
        - blade
          - outer portions
            - **outer portions** configured to engage or come to close proximity with **ground** so as to pick up **snow**
        - panel adjacent sweeper
        - edge of scraper bar
        - **scraper bar** engages sweeper proximate to **outer circumferential perimeter of sweeper**
        - **scraper bar** removes **snow** from **sweeper** and directs such **snow** into **auger housing**
        - **scraper bar** inhibits **recirculation the snow** back to **underlying terrain**
        - **scraper bar** adjacent **sweeper** rearward of **second axis**
        - **scraper bar** coupled to **housing** along **bottom** of **housing**
      - housing
        - mouth
          - **mouth** defined by **bottom edge** , **top edge** , **first side edge** and **second side edge**
          - **mouth** facing in a first direction
        - side
          - depressment
        - elongate slot
        - rotating snow moving member
        - bottom
        - skid shoe mounting structure
      - knife
        - plurality of outlets
          - **plurality of outlets** dispose along **edge of scraper bar** located along **lower edge** of **mouth of auger housing**
        - manifold
        - nozzles
        - **knife** directs **compressed gas** and/or **additives** at **forward angle** ,
        - **knife** extends along **majority** of **axial length of main auger**
        - **knife** directs **gas/additives** forwardly of **edge of scraper bar**
      - engine
        - output
          - single output

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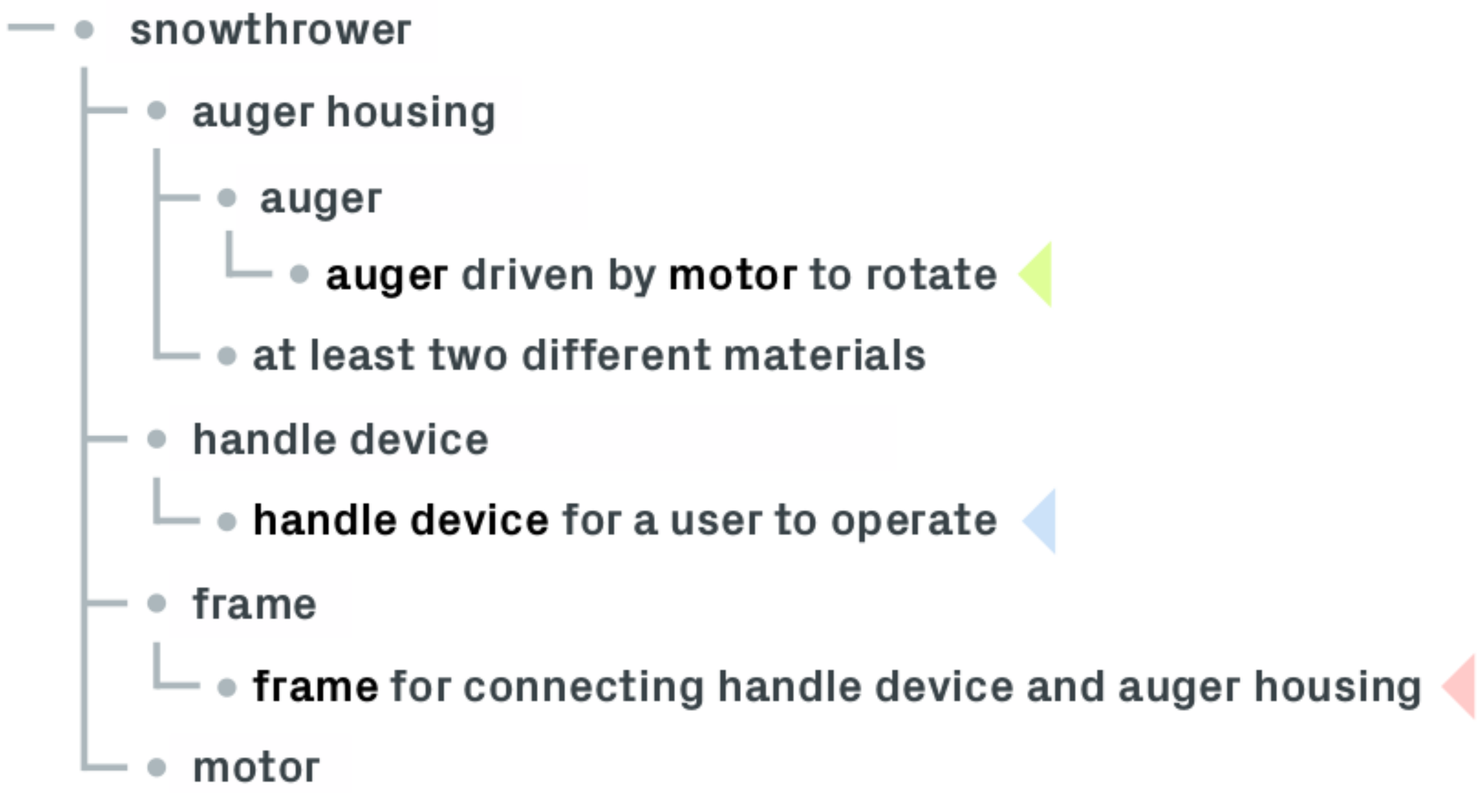
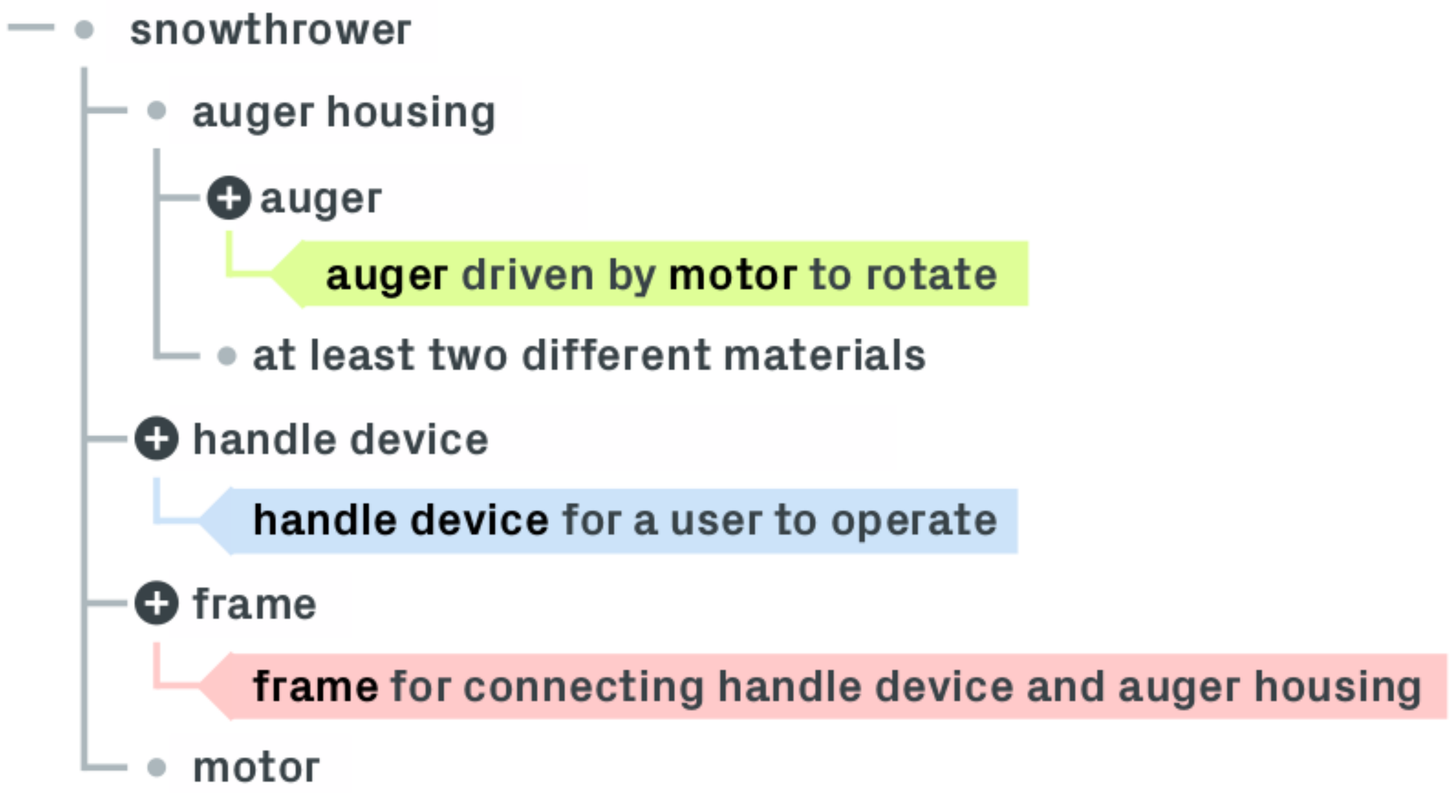
Graph→embedding (TreeLSTM)



Kai Sheng Tai, Richard Socher, and Christopher D. Manning. 2015. Improved Semantic Representations From Tree-Structured Long Short-Term Memory Networks. https://doi.org/10.48550/ARXIV.1503.00075

Graph→embedding (TreeLSTM)



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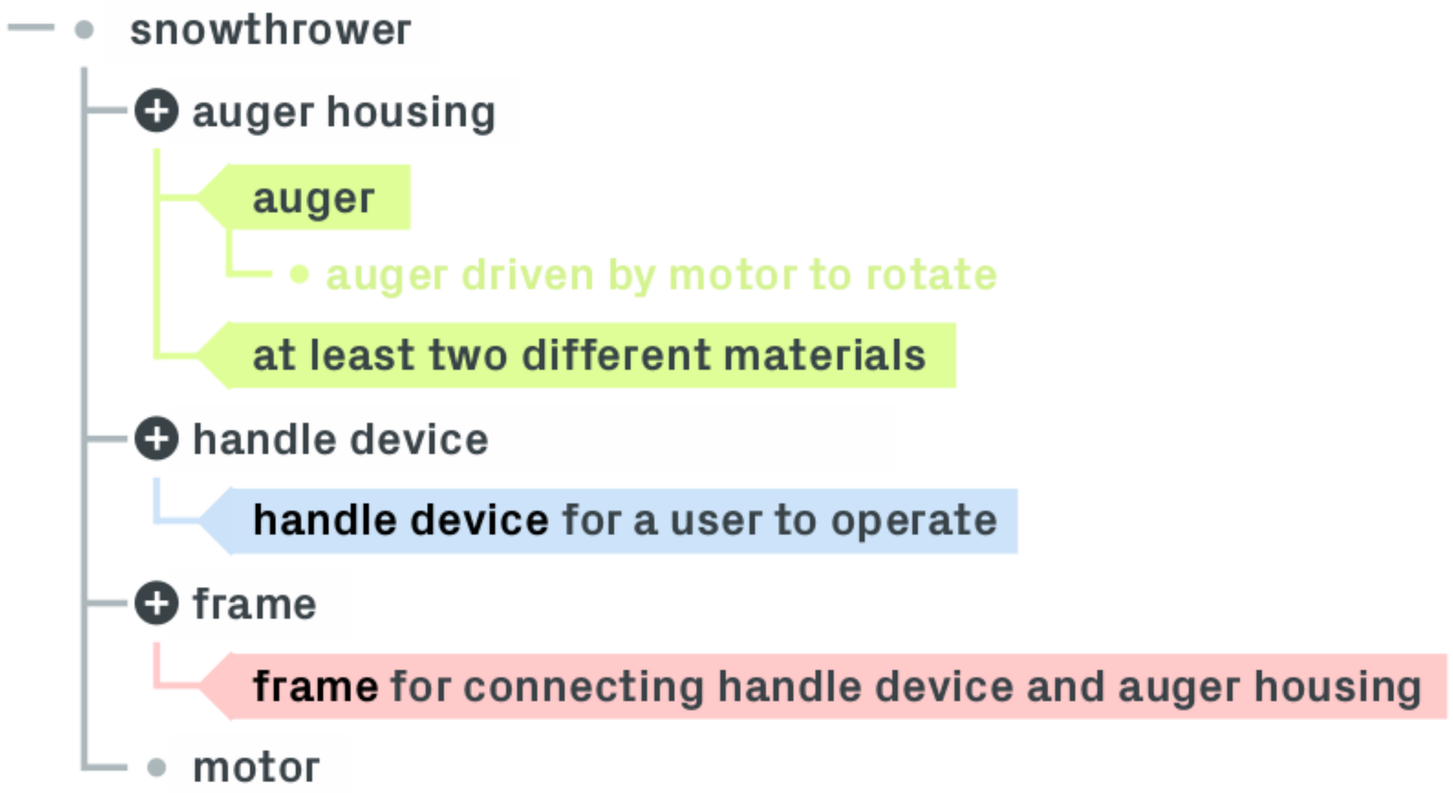
Graph→embedding (TreeLSTM)



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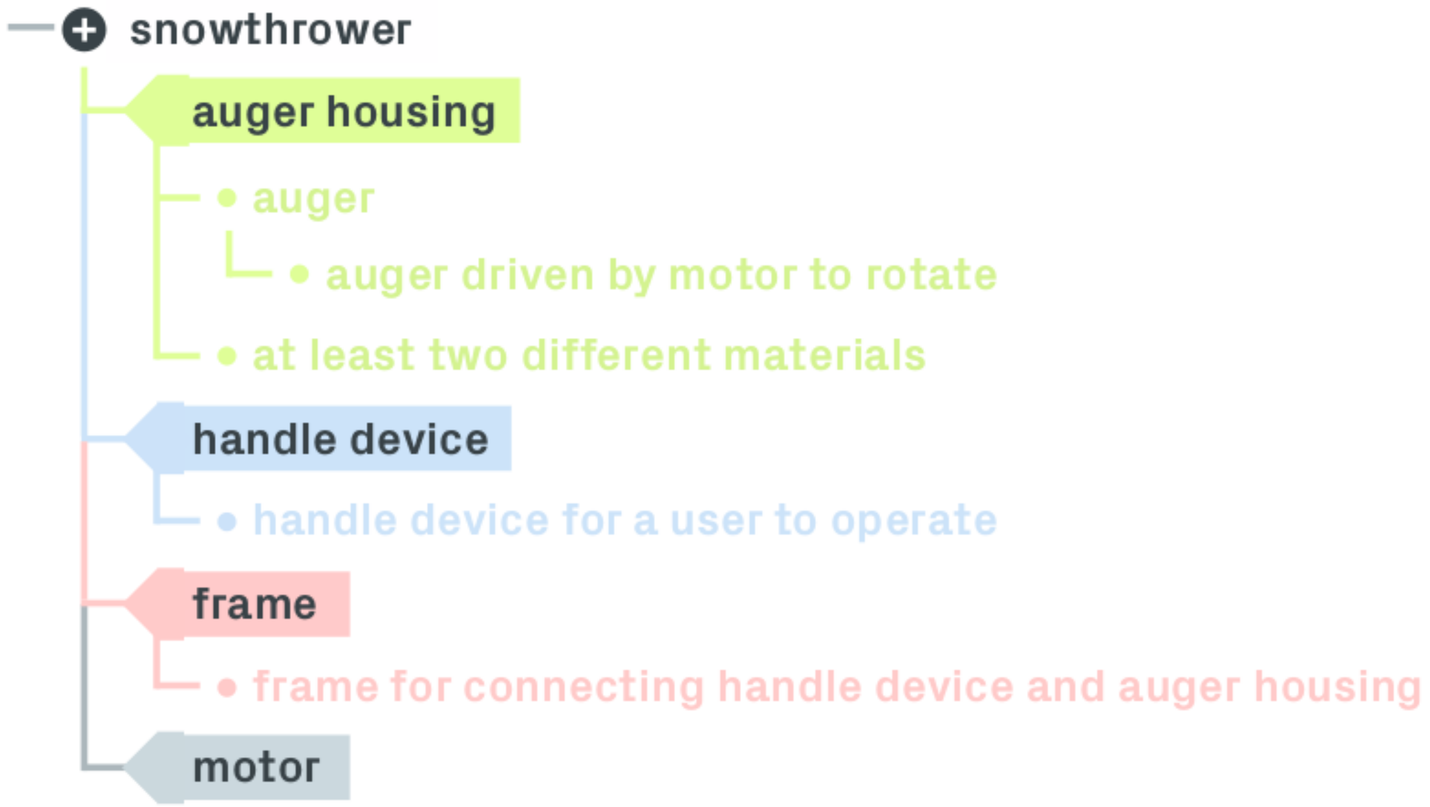
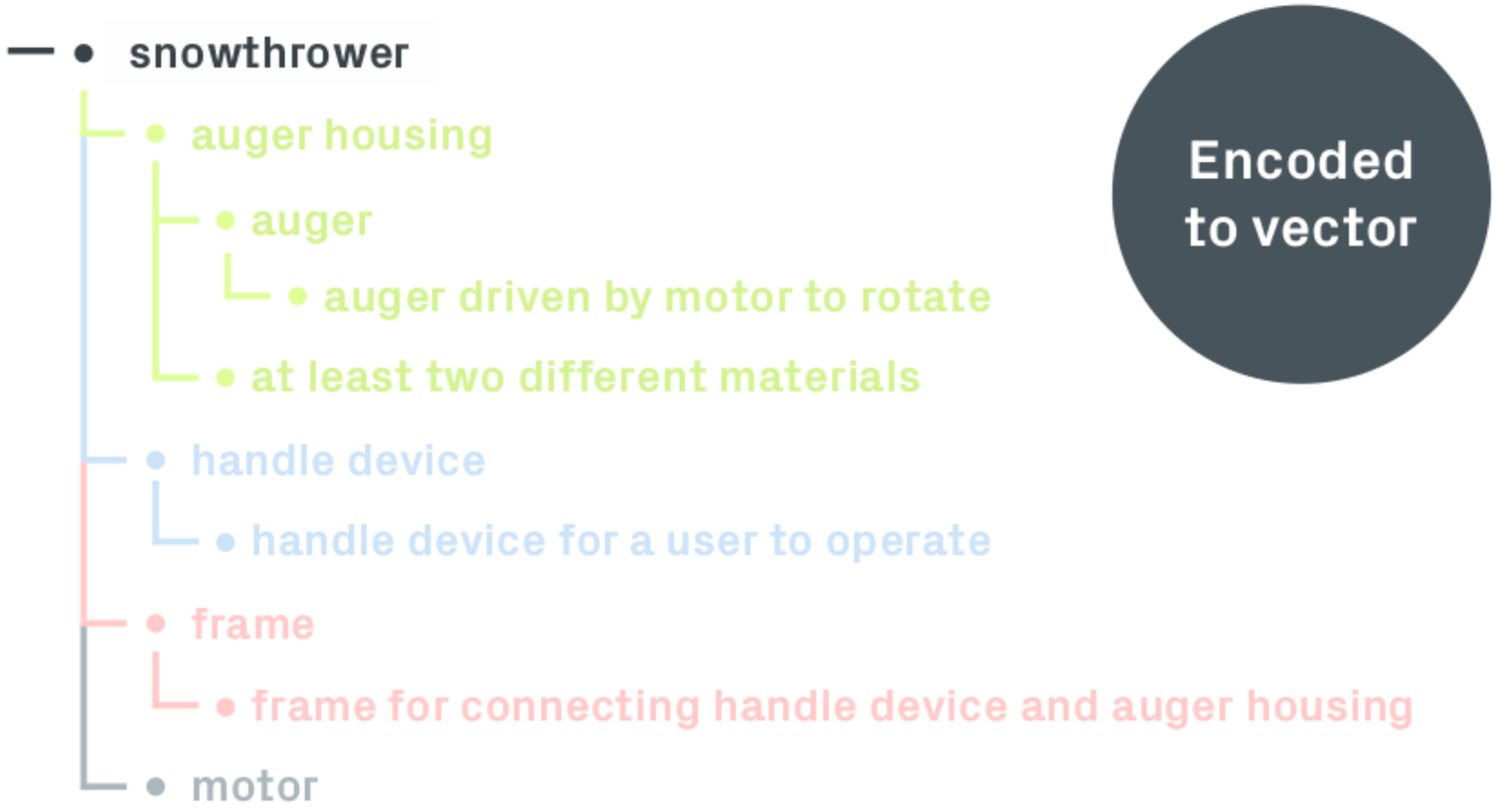
Graph→embedding (TreeLSTM)



Graph→embedding (TreeLSTM)



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*Document that was eventually used by an examiner to **deny novelty or inventive step** in the first office action was found among the **top 20 ranked documents in more than 40 per cent** of the cases.*

PRH Finnish Patent Office

*IPRally found **highly relevant documents (X or Y) in 56% of all cases** and relevant A-documents in about 75% of all cases.*

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European patent office

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US20190016270A1 (Claim 1)

Monitoring

- vehicle
  - bike supporting device
    - first wheel supporting member
      - first end
        - pivotal connection
          - **pivotal connection** on **carrier member**
          - **pivotal connection** is configured to be positioned proximal to **rotational axle** of **first bicycle wheel**
    - second wheel supporting member
      - first end (second wheel supporting member)
        - connection
          - **connection** on **carrier member**
          - **connection** is configured to be positioned distal to **rotational axle** of **first bicycle wheel** and **second free end** configured to support **first bicycle wheel**
    - carrier member
      - proximal end
      - distal end
      - **carrier member** is configured to support **bicycle**
    - supporting structure
      - **supporting structure** configured to attach **carrier member** to **vehicle**
    - **vehicle** mounted **bike carrier**
  - first bicycle wheel
    - rotational axle
  - second free end
    - **second free end** configured to support **first bicycle wheel**
  - bike carrier
  - bicycle

Results | Citations 39 | Favorites | Statistics | HIGHLIGHT

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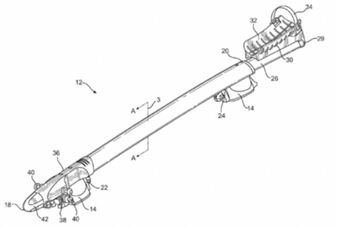
	Title	Applicant	Published	Score
1.	BIKE CARRIER US20160068111A1 | WO | EP | CN Cited	Horizon Global Americas Inc	2016-03-10	58 More
2.	Bicycle carrier for a vehicle GB2528973A	KITCHER BENJAMIN JOHN	2016-02-10	56 More
3.	Extendable Fork Forward Bicycle Carrier US20150246644A1 | WO	Thule Sweden AB	2015-09-03	56 Less
4.	Bicycle carrier	SHAVER; TORI	1999-12-07	56

Abstract: A vehicle rooftop mountable bicycle carrier including a load bar spanning element with front and rear foot attachments and having a fork mount with skewer positioned forward of the front foot attachment and including an extendable element with a wheel cradle couplable to the load bar spanning element and having the wheel cradle attached at the rear end of the element.



Application date: 2013-09-10
Priority date: 2012-09-11 (US201261699796P)
Inventor: MAKRIS TIMOTHY, DETWEILER JAMES
CPC classification: B60R 9/045, B60R 9/048, B60R 9/10
IPC classification: B60R 9/048, B60R 9/10, B60R 9/045
Legal status: INACTIVE (Abandoned)
Family status: INACTIVE
External links: Google Patents, Espacenet, PatBase Express, PatBase
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