Stacks

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Outline

Stack

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  - which is so standard
  - that Java didn't even bother making it an Interface.
- Like any kind of stack we can think of,
  - the top entry is easy to add, view, or remove.
  - Trying to add, view, or remove entries in the middle is messy and awkward.

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  - I don't think of it as *pushing*,
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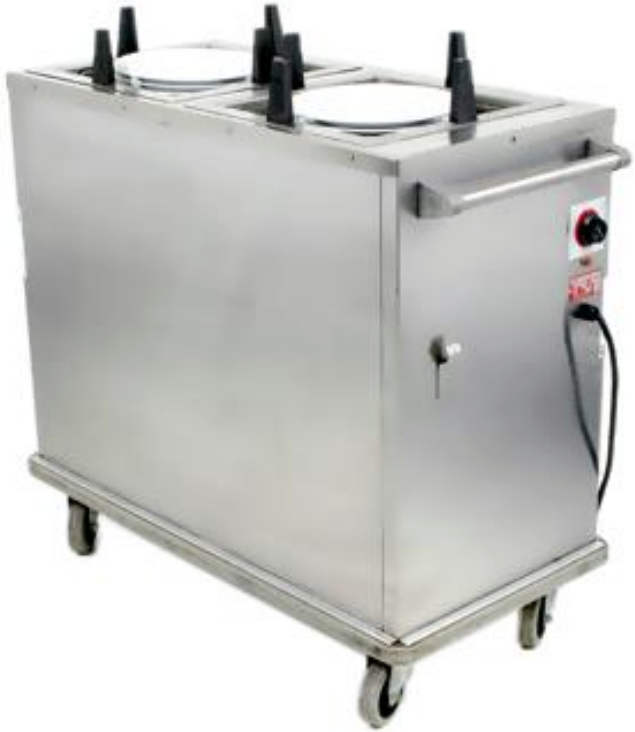
  - Peek and empty make sense though.

Name Origins

I think what the original inventors had in mind was a 1950s buffet diner spring loaded plate dispenser.



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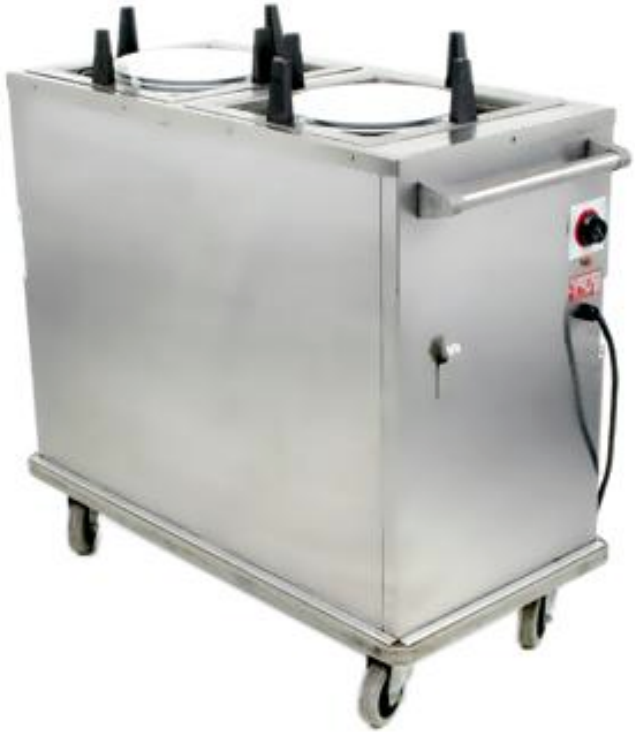

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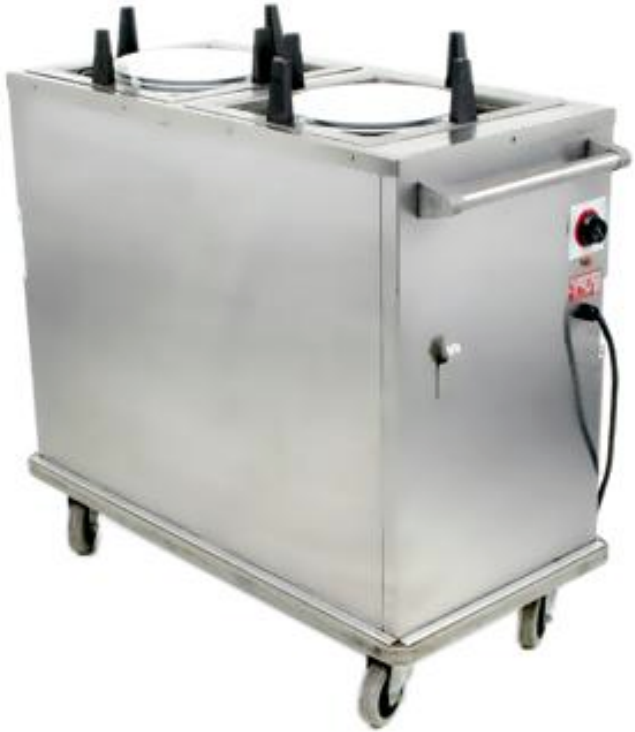

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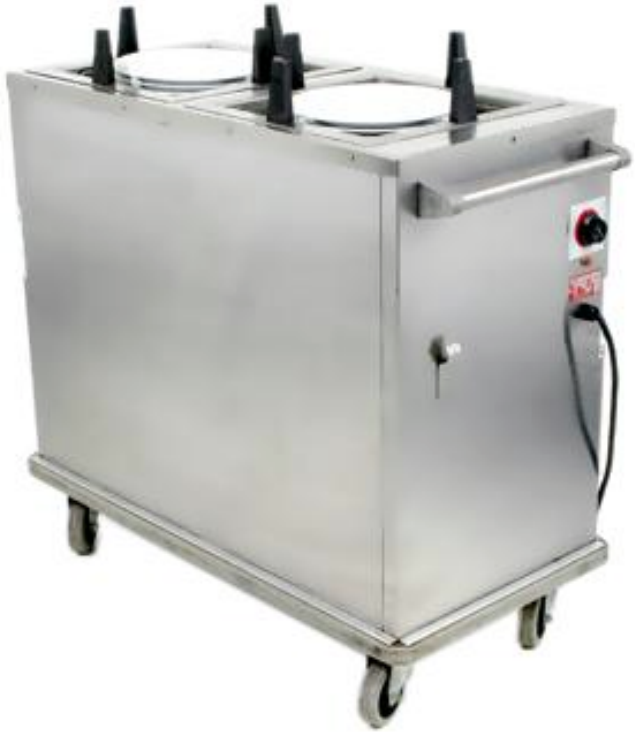

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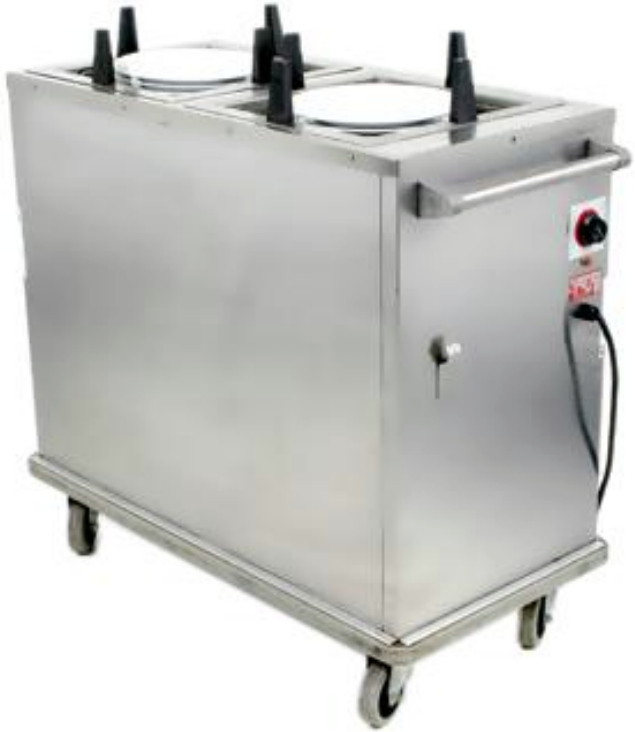

- The power cord is to run a dish warmer.
- It doesn't shoot the dishes up when it pops!
- Instead, it always keeps the top dish level with the top of the dispenser,
- although I don't think that requires electricity.

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stack.empty();                  // returns false
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stack.push("cantaloupe");
stack.pop();                    // returns "cantaloupe"
stack.pop();                    // returns "banana"
stack.empty();                  // returns false
stack.pop();                    // returns "mango"
stack.peek();                   // throws Exception
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This is less efficient (by a constant factor in space and time) than creating a specific StackOfChar, etc., but it is usually good enough.

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- So push is O(1),
- (unless the array is full and needs to be reallocated).
- This is the fastest way to implement a stack,
- but it might not be good for real time programming.

(Sorry the laser stopped in the middle of your eye, but we have to allocate a bigger array!)

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- Implement using an array.
- Adding is $\mathrm{O}(1)$ except for reallocate().

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- Implement using an array.
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LinkedStack

Summary

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- Use Java *List* interface.
- Use add(item), size(), get(index), remove(index).

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- Use Java *List* interface.
- Use add(item), size(), get(index), remove(index).
- ArrayList implementation uses partially filled array.

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- Implement using an array.
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LinkedStack

- Private Node class.
- node.next instead of node.getNext()
- Push and pop at front (head) of list.

ListStack

- Use Java *List* interface.
- Use add(item), size(), get(index), remove(index).
- ArrayList implementation uses partially filled array.
- LinkedList is another implementation of List using a doubly linked list.