

COFFEEHOUSE CUP HOLDER

- 1) Since the cups are relatively rigid, a tray which has holes of a diameter smaller than the diameter of the mouth of the smallest cup could be used to easily and securely hold the cups. The cups are simply dropped into the holes and catch when the angled side of the cup becomes wider than the diameter of the hole in the tray. To remove the cups, one simply needs to put the tray down as gravity will pull the tray downward and allow the cups to be freed from the tray. Some sort of holder would need to be designed so that the cups could be held in the tray when the tray is being loaded. Large, ergonomic handles on the side of the holder would allow for easy carrying.
- 2) One large difficulty for many of the deliverers is having to hold the tray with both hands while collecting money from customers. To solve this problem, a cup holding tray which requires only one hand to be held securely could be employed. There could be a set of hinged handles at either side which meet in the middle and could be gripped in one hand. The connecting rods of the handles would act as supports, equally transferring force from each of the corners of the tray itself.
- 3) Finally, one could also create a one-handed holding system by using a crate somewhat similar to that used to collect tennis balls. This tray would have higher walls that partition off separate slots for each of six cups. The cups would fit snugly into their slots but still be able to be removed easily. There would be a single handle mounted in the center of the basket-like device that could be gripped easily in one hand. This device would be bulkier than the others, but its size would make it rather secure. One of the compartments could also easily be used for money storage.

CAFETERIA TRAY

- 1) A slightly raised insert with holes cut for each of the objects could be snapped into the tray using a system of latches. The insert would be raised to create a coupling moment around the bottom of the cup to prevent tipping. This insert should be detachable and washable on the high-heat sanitizing dish washer used by the PLC. The latching system should also be relatively simple so that the teachers can easily insert the part into the standard trays.
- 2) A more secure system would be to use Velcro (Or some other adhesive) patches on the bottoms of the cups to hold them to the tray. The whole tray could have a Velcro insert attached, so the student would still need to learn how to place the items on their tray. One issue would be washability for the objects themselves. A waterproof connection method, such as implementing magnets into the basis of the cups, could also be used.
- 3) The most secure system but hardest to use would be to screw the cups and bowls into the trays using some sort of locking system (Similar to those used for thermos tops). This idea would require modifying all the cups and bowls as well as creating an insert for the tray. Deformations caused by heat increases and decreases in the sanitizer could also cause this system to fail relatively quickly.
- 4) Finally, a detachable strap could be attached to the front corners of the tray and then placed behind the child's neck. By putting the weight of the tray on the neck and shoulders rather than on the hands and arms entirely, one could make it possible for the students to carry the tray with only one hand. This strap would be attached in a fashion to the way those on camera cases are attached, and it would be padded to make sure it was comfortable.