CONTOURED OUTPUT BIN DESIGNED TO PASSIVELY STOP, NEATLY STACK, AND ALLOW RETRIEVAL OF A VARIETY OF A3 SUPPORTED MEDIA SIZES

HP INC
Contoured output bin designed to passively stop, neatly stack, and allow retrieval of a variety of A3 supported media sizes

This disclosure relates to the field of mechanical engineering, specifically to stacking for printing devices.

This disclosure is for an output bin design that utilizes a contoured shape which eliminates user interaction while optimizing clean sheet-to-sheet alignment of ejected printed pages (stacking) of A3-supported media sizes. The contoured design has a four-part shape comprised of an initial inclined slope rising to an inflection point, then a declining slope preceding an inclined "tail". Neat stacking is an important user requirement that is often satisfied with the addition of an active, user-adjusted barrier (backstop) that stops the travel of ejected media. Active backstops require user interaction to be set to the appropriate distance based on media size. Improper size adjustment can result in curled pages, large offsets, ejection jams, or other unsatisfactory stacking performance. Conversely, not using any backstop can result in media being pushed out onto the floor due to page-to-page friction and pushing (snowplowing), and high variability in stack neatness due to sheets being offset and twisted relative to each other.

The disclosed design solves these issues common to many current designs across different print technologies in a manner that may be customized to accommodate the various space and use needs of different platforms. The design simplifies and eliminates user interaction without sacrificing stacking performance (namely, stack neatness and media ejection). This design integrates a sloped backstop which does not need any adjustment to provide quality stacking, allowing for simplified field use. Additionally, the design simplicity and lack of moving parts allows for easier and less expensive manufacturing and assembly, and eliminates costs of field repairs for broken parts.

Current designs for media output bins have many shortcomings depending on the type of design used. A common current design is to have a manually adjustable backstop to serve as a physical barrier to stop and neatly stack pages of a specific media size. Active backstops can cause major stacking quality issues when not adjusted to the proper printed media size. For instance, if the backstop is left in the Legal position for an A3 page, the A3 document will be stopped before it is completely ejected from the print engine. This results in media curling, leading and trailing edge damage, potential jamming in the eject rollers, and, generally, poor stacking. In an office using multiple media sizes, adjustment of a media stopper might not be possible between jobs from different users.

Designs optimized for A3-sized media might sacrifice stack quality of A4-sized media. Being half the media length, A4 media must be stacked at a different location and in a different manner than A3 media. These separate A4 stack controllers can interfere with the stacking dynamics of A3 media, degrading finished stack quality.

Steeply inclined output bins typically have lower output bin capacities (especially for larger media) and may not be appropriate due to space constraints of overhanging accessories.

Some designs do not utilize any sort of media backstop. Rather, they rely on page-to-page friction or an increased slope throughout the bin to stop the media. For large media, the friction of stacking is much more complex than A4-sized media, resulting in poor stack quality and an increased likelihood of pages getting pushed out of the open bin and onto the floor.
There are problems inherent to existing solutions which this disclosure addresses. Output bins with adjustable backstops that enhance stack quality are complex, resulting in higher manufacturing and field repair costs. This design is simple to manufacture and does not require subcomponent assembly as an adjustable backstop would. It can be molded as a single part and would not require labels or lettering to size adjustment control. The simplicity decreases opportunity for error in manufacturing, assembly, and use. Active backstops also require user interaction before stacking occurs. When users do not engage an active backstop media can be pushed out onto the floor or otherwise not controlled during stacking. With a passive media stopper, user interaction is not required for adjusting the stopper for different sizes of media. This allows jobs of differing sizes and orientations to be sent consecutively without downtime or stacking failures related to adjusting a backstop. This would decrease service costs by reducing the number of service calls and visits to simply adjust a manual backstop or fix damaged parts due to stacking failure jams.

When media is not neatly stacked, or when a stack is not easily accessible, it can be difficult for a user to retrieve the printed stack. The open-tailed end of this design allows simple stack retrieval out both the side and front of the output bin; whereas an active backstop can only be retrieved from the front of the product. Bin full capacity is not sacrificed by this contoured design; unlike complex backstops that require additional space for mechanical components and steeply inclined bins which limit stack capacity because they interfere with any overhanging accessories.

Large media can be difficult to stack without anything controlling the ejected pages, resulting in pages being pushed onto the floor, pages skewing relative to each other, and pages not stopping into a neat vertical stack. Curled pages for both laser and ink printing technologies can have a difficult time breaking to a flat shape and stacking neatly. Separate designs for A4 and A3-sized media integrated into the same system interfere with the stacking process of each other. For example, designs optimized around A4 stacking often degrade A3 stacking performance. The disclosed design accommodates a variety of media sizes and characteristics, allowing its use across multiple products. Additionally, this is accomplished without sacrificing stacking quality for A4-sized media.

The contour design has a four-part shape: An initial inclined slope (Figure 1, A) for smaller media, an inflection-point above (B) to help control the shape of long media, a declining slope (C) to slow the stacking media, and an inclined tail (D) to control the stopping of larger media. An important feature of this design is that it does not compromise Letter size stack quality. The initial inclined slope (between 10-30 degrees incline) matches similar Letter/A4 output bin designs which stack media quite well. For long media, the inflection point (B) is the first location of contact between the media and the output bin. The inflection point is the transition into a downward slope (C) which breaks the beam shape of media towards the middle of the sheet and causes the media to follow the shape of the declining slope. The inflection point should be 10-12 inches horizontally from the page ejection rollers and 0.5-1 inch above where the media first contacts the output bin. The declining slope of the contour balances the sheet to sheet friction, which helps slow the page while reducing the possibility of ejection of a previously stacked page. The shallow downward slope (5-15 degrees) provides just enough friction to slow the stacking page in comparison to a flat or inclined output bin. Flat and inclined bins increase page to page friction force that causes the stacking media to move the previously stacked sheet(s) in the forward or backward direction.

The inclined tail (section D, 2-4 inches long) acts as a passive stopping section for large media. Larger media must overcome increased vertical gravitational forces of the inclined end stopper (leading
part of the sheet) and the inclined LTR/A4 section (trailing part of the sheet). The momentum of the sheet is first slowed by the page to page friction in the middle portion (C) of the contour. The angled upward slope (10-30 degrees) uses a transition in frictional force (due to gravity) to pull the sheets to rest uniformly. Since the forces needed to eject media out the end of the bin are greater than the momentum of the stacking page coming out the eject flap, the stacking page does not have enough energy for continued motion and comes to rest. See in figure 2 how the stack stops in the early part of the inclined tail. This tail serves the stopping purpose that active backstops would provide, but does not require user interaction.

Figure 1: Contoured output bin design

Figure 2: Successfully stacked media highlighting the effect of the inflection point

This contoured output bin design is applicable to multiple platforms (including laser and ink technologies) since the exact length of each section and location of the inflection point can be fine-tuned for the media types the printer is designed to support (i.e. A4 vs A3). The contours make it
possible for media of different sizes to neatly stack by incorporating an inclined slope that historically stacks smaller (A4/LTR) media uniformly, and a downward slope that breaks longer medias as they eject from the eject flap to slow speed and reduce sheet to sheet friction. Similarly, curled media’s upturned shape gets “broken” by the curvature of the output bin to flatten and neatly stack curled media. The angle of the slopes can also be modified to increase or decrease bin capacity, which simultaneously improves or worsens stack neatness.

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