March 2023

a-SiD Binding Release Mechanism

HP INC

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Abstract

In the printing industry, and even more specifically in the digital printing industry, the use in highly accurate printing cylinders with small runout is verry common. In order to meet accuracy demands and allow simple and easy removal for maintenance purposes, the printing cylinder is usually positioned upon 2 tapered areas. A combination of thermal deformation upon the tapered areas (especially when the cylinder and tapered areas are made of different materials with different coefficients of thermal expansion), with the shallow taper angle, and the contact friction creates a situation of “self-locking”, which “binds” the cylinder to the tapered areas firmly together.

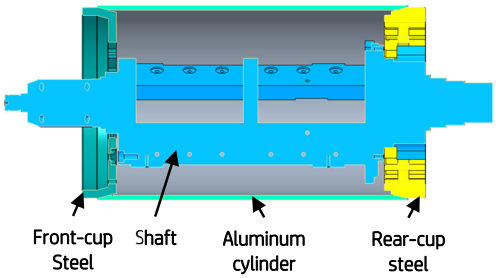
This document will introduce a method for releasing the cylinder binding, allow simple cylinder replacement while dramatically reducing the potential for mechanical cylinder damage.

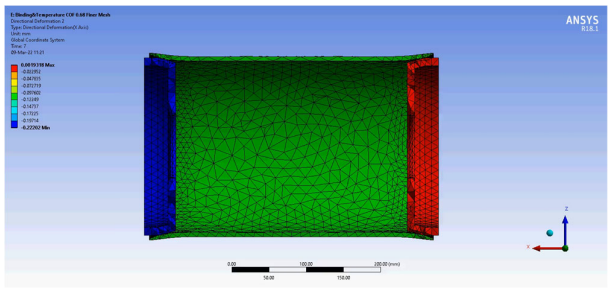
The Challenge

In order to allow easy installation, meet accuracy demands and having proper mounting - shallow taper cone angle is usually used. However, shallow taper cone angles significantly increase the risk of binding - the phenomenon of tapered cylinder firmly attached to its mounting elements. The amplitude of the binding is mainly affected by the following parameters:

- Materials (coefficient of friction and thermal expansion)
- Taper angle
- Tolerances and misalignments

In the print industry, the installation temperature is ~22-28°C, and the working temperature may reach ~40-50°C or even higher. If a printing cylinder is made of aluminum and its mating mounting part is made of steel during work, the aluminum expands more than the steel. Since there’s a preload force between the 2 steel tapered parts and the printing cylinder, as the temperature rises, the mating parts “penetrates deeper” into the printing cylinder. When the temperature cools back down (e.g. for maintenance purposes), the thermal “shrinkage” of the Aluminum cylinder upon the steel mating parts, together with taper angle, coefficient of friction and misalignments creates a very significant binding that cannot be released manually due to thermal stresses. Usually hammer impacts are required. As the printing cylinder is very brittle and fragile, hammer impacts are not acceptable, and also decreases the level of user experience.





The invention

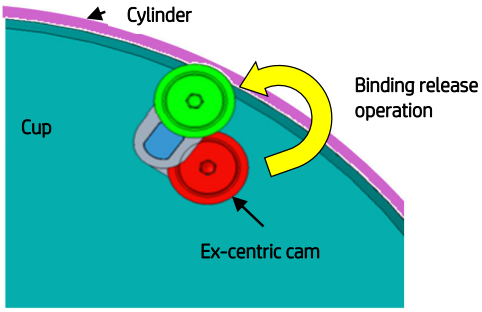
By using an Ex-centric cam and applying radial force between the inner printing cylinder and the cup, the binding will be released.

Built-in on the inner side of the cup, an ex-centric cam mechanism is placed. The operation of the mechanism is done from the external side of the cup (which is accessible to the operator).

As default, the ex-centric cam is kept away from the inner diameter of the printing cylinder in order to allow proper installation and printing.

When binding occurs and cylinder removal is required, by rotating the ex-centric cam, it will gradually come into contact with the inner surface of the printing cylinder and will apply local radial force between the inner cylinder diameter and the cup. This force will gradually and locally increase the gap between the cylinder and the cup. And when locally the gap is positive (meaning cylinder not touching the cup's tapered area) the binding will be released all over the cup's circumference simultaneously.

By using a cam follower or a bearing, wear on the inner cylinder diameter can be reduced significantly and become negligible. Simple calculations can be made in order to assure all cylinder's deformations are elastic and will not make permanent damage to the cylinder itself.



Advantages

- **Definite binding release mechanism -** Targets the binding area directly and allows immediate binding release.
- **Improve TCE** - Allow simple manual printing cylinder replacement without using dedicated tools.
- **Improve lifespan & CPP** - Remove the risk of mechanical damage to the very expensive, brittle and fragile cylinder due to hammer impacts or other "violent" removal procedures.
  In addition, the risk of damaging other press sub-systems is reduced.

Summary

This document discloses a very simple and user-friendly robust mechanical solution for the phenomenon of taper cylinder binding, which allow immediate and definite release that doesn't require complicated procedures.

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