EXPANDABLE LAYER MADE OF COMPRESSIBLE MATERIAL

This application claims priority to German Application No. DE 199 18 432.1, filed on Apr. 23, 1999, and PCT/DE00/01092 filed on Apr. 6, 2000, both of which are herein incorporated by reference in their entirety.

BACKGROUND

1. Field of the Invention

The present invention relates generally to rotary printing form processes, and more particularly, to an expandable layer made of compressible material placed in a rotary printing form between a core cylinder and a sleeve.

2. Background of the Invention

Primarily two different rotary printing form processes are used in the printing industry.

In the intaglio printing process metallic cylinders fitted with a function profile on the surface are predominantly used. Usually, steel rollers are galvanically plated with a copper layer, which then carries the function profile.

In flexography printing, rotary printing forms, which have a sleeve fitted onto a metallic roller core are often used. The sleeves are often galvanically made into, for example, nickel sleeves or consist of fiber reinforced thermoplastic materials. The function profile is located on the outer surface of the sleeve.

Other technical areas use metallic cylinders with a technical surface, for example, coatings of polytetrafluoroethylene, which have an anti-adhesive effect, metallic sleeves or hollow cylinders with a technical surface as well as rolled fiber reinforced thermoplastic sleeves with a technical surface. Similar to the manner in which the sleeves in flexography printing are attached, the technical sleeves could then be pneumatically attached to the roller core. They are also used as pipes or semi-finished products for cylinder production.

Sleeves are more and more often produced using thermoplastic pipes or flexible hoses or they are made of composites. The rubular semi-finished products are attached or as the case may be lead onto a conical cylinder using a heat source. This is described in further detail in the unpublished application DE 198 54 735.8. Non-conical production cylinders, too, could be used for the sleeve production. After heating the production cylinder using, for example, a heat transporting liquid or a pre-connected heating process, the rubular semi-finished product is pushed onto the production cylinder using a force fit direction. It is also possible to lead the semi-finished product directly from an extruder onto the production core. After the attachment process the production core is cooled so the thermoplastic material of the sleeve consolidates. Depending on the adjustment of the production parameter, the post consolidation frozen tensile strengths can be adjusted in such a manner that the sleeve remains on the production cylinder or that it will be de-molded. The de-molding could occur with the help of, for example, a scraper.

The de-molded sleeves could be placed on and removed from a corresponding core cylinder. This could occur pneumatically or mechanically. The connection of the sleeve to the core cylinder, which is made of, for example, steel or synthetics, can occur using frictional resistance or a mold clamping mechanism. When using a frictional resistance connection, the sleeve is made on a production core, which has a slightly smaller diameter than the ultimate core cylinder. The production core may also show the same deviations whereby the residual stress generated during the production is taken advantage of.

When using the mold clamping mechanism connection, the sleeves are made on a production core, which is fined with geometric structures, for example, grooves that are cast into the sleeves. The core cylinder carries the complimentary structure so that this combination will constitute the mold clamping mechanism.

It has proven to be advantageous, as has been described in DE 198 34 735, to provide the core cylinder or, as the case may be, also the sleeve with a compressible expandable layer. Should the sleeve material not show enough elasticity itself, such an expandable layer will have a balancing effect. This expandable layer is, in particular, necessary when the sleeve must be attached in a detachable union. It prevents the sleeve from being damaged by the high pressure during attachment and removal. Furthermore, the use of an expandable layer can evenly distribute the surface pressure on the sleeve. An expandable layer is also necessary during de-molding using air to allow the air cushions to be effective on the entire surface in order to ensure problem free attachment and removal of the sleeve.

Furthermore, the expandable layer has the advantage that small irregularities on, for example, the inner tubular surface of the main casting do not have an effect on the sleeve since they are smoothed out later on the core cylinder by the expandable layer. Expensive interior work such as honing is thus not necessary. It is also in this manner that other critical semi-finished products such as extruded thermoplastic pipes or composite plastic pipes produced using pultrusion can substitute for the sleeve. It remains an advantage that geometric structures can be cast on the production cylinder during production.

In this manner the expandable layer on the one hand stores the force, which is necessary for the frictional resistance connection between the core cylinder and the sleeve and provides the force locking between the two. Simultaneously, the surface pressure is evenly distributed.

As mentioned above, a function profile is introduced in the sleeve after the production process. This could occur through direct structuring using a laser beam, through de-ionization or through mechanical machining. In a second process, coatings made of polyurethane, polytetrafluoroethylene, copper, and other such materials can be positioned and will then be available as a functional layer. Flexography printing blocks may be directly attached. Depending on the ultimate purpose, tubular main castings of different materials and sizes are used. The use of expandable layers allows the sleeve itself to have a thick wall thickness so that it can only be slightly stretched.

The sleeve is used as a printing form for intaglio printing, flexography printing, or for embossing, and with the help of lasers mesh structures may also be introduced into the sleeve.

It can be used as a technical sleeve and would in that case be inserted without core cylinder.

The functional layer could also be, for example, a surface layer protection.

The function profile also includes penetrations, perforations, and the like through the sleeve. In this manner it is also possible to perforate the sleeve as a sieve. Then such a sleeve could, for example, be used as a rotation sieve for the straining of bulk materials, or as a suction cylinder, for example, for the removal of foils or for the draining of water from paper.