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(12) # EUROPEAN PATENT APPLICATION

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(71) Applicant: **DRG (UK) LIMITED**
1 Redcliffe Street
Bristol, BS99 7QY(GB)

(72) Inventor: **Offer, David Henry**
23 Oakdale Court
Downend Bristol. BS16 6DZ(GB)

(74) Representative: **Stuart, Ian Alexander et al,**
MEWBURN ELLIS & CO. 2/3 Cursitor Street
London EC4A 1BQ(GB)

(54) **Printing roll with detachable sleeve.**

(57) A detachable printing sleeve (1) and roll core (6) have complementary formations (100,101) which prevent rotation of the sleeve about the core, e.g. when subjected to high printing pressures.

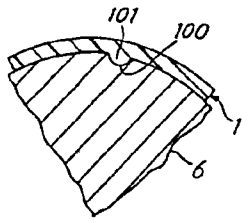

FIG.3

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PRINTING ROLL WITH DETACHABLE SLEEVE

The present invention relates to a printing roll with a detachable sleeve. It is particularly concerned with rolls and sleeves as disclosed in British Patent 1,581,232. That patent discloses a printing roll having a tapered core and a sleeve which forms under stress an interference fit with the outer (tapered) surface of the core. The core has outlets for compressed air on its outer surface spaced from the ends. One end of the sleeve has, in its unstressed condition, an internal diameter between the maximum external diameter of the core and the external diameter of that portion of the core with gas outlets in its surface. The sleeve is slightly expandable, e.g. being formed by coating a shell of fibre-reinforced plastics material with an uncured elastomer and curing the elastomer in situ. Thus the sleeve may be fitted onto the core by passing the sleeve, larger end first, over the smaller end of the core, until the sleeve and core touch around the inner circumference of the sleeve, with the sleeve having covered all of the gas outlets. Applying gas under pressure inside the sleeve through the outlets then expands the sleeve radially sufficiently to allow it to be passed fully onto the core. When the gas supply ceases, the sleeve then makes an interference fit. The sleeve is thus very securely in place, but can quite easily be removed after resumption of the gas supply.

As a rule, the fitting of the sleeve onto the core is so tight that there is no problem of relative movement in use. However, there may be cases where a small amount of displacement of the sleeve around the core occurs, e.g. when printing with very high forces, or when the fit is imperfect, possibly with an aged sleeve. This is particularly so with gravure printing sleeves where high printing pressures are used, and very accurate register is required. Gravure printing rolls are usually characterised by a metal outer surface which is etched to provide the image.

Japanese Patent Laid-Open (Kokai) 54-4601, addresses itself to this problem. A method is suggested, for the prevention of the relative movement between the sleeve and the core, by pouring cement, lead alloy or the like, in a molten state, into the space between the sleeve and the core. This method has serious drawbacks. Firstly, the filler requires a prolonged length of time for solidification. Secondly and more importantly, the filler causes permanent bonding between the core and the sleeve and the only method of disassembly involves the destruction of the sleeve or worse of the printing core itself.

EP-B-53791 describes the use of a hot melt adhesive for the bonding of the sleeve and the core roll. The hot melt is a thermoplastic adhesive which melts upon heating and then sets to form a firm bond on cooling. In this case, the sleeve can be removed in a reusable form, by the application of heat such that the thermoplastic adhesive remelts. This

method is unsatisfactory from the point of view that heat is required for the attachment and detachment of the sleeve. Distortion of the surface of the sleeve, is also likely due to the presence of the adhesive.

According to the present invention there is provided a roll with a detachable sleeve, e.g. a printing roll or a back-up roll, comprising a core and a sleeve, wherein complementary formations are provided which are engageable on passing the sleeve onto the core, and which act to prevent relative rotation of the sleeve and core. Preferably the formations comprise a key and a keyway. Suitably the key is provided by the sleeve, and the keyway is provided by the roll core. Preferably the keyway is a slot or groove which runs the whole axial length of the surface. It is preferably of arcuate cross-section. The key may be a complementary rib with a cross-section that fits precisely within the groove. Alternatively, key and keyway may each be parallel sided, the keyway being a slot slightly deeper than the height of the key.

Some embodiments of the invention will now be described in greater detail with reference to the accompanying drawings in which:

Fig. 1 is a schematic diammetrical section through an embodiment of sleeve and core on the line I-I in Fig. 2;

Fig. 2 is a section on the line II-II in Fig. 1;

Fig. 3 is a schematic enlarged detail of a sleeve and core according to a first embodiment; and

Fig. 4 is a view like that of Fig. 3 but showing a second embodiment.

Figs. 1 and 2 are in most respects identical to Figs. 1 and 2 of GB 1,581,232. Thus they show a printing sleeve 1 which consists of a radially inner shell 2 surrounded by a rubber layer 3, on an outer surface 4 of which relief may be formed for printing surfaces. A radially inner surface of the shell has a progressive change in diameter between its ends, the example shown being a frusto-conical taper. Of course, both the thickness of the sleeve and the degree of the taper are much exaggerated in the drawings. A taper of the order of 0.00025 units of change in diameter per unit of axial length is suitable. The shell 2 is of constant radial thickness so its outer surface 16 has the same taper as the inner surface 5. The printing surface 4 is however a true cylinder.

Fig. 1 shows the printing sleeve 1 in its working position (i.e. axially central along) on the working length of a printing roll core 6. The core 6 is hollow, having an incompressible hollow metal tube 7 supported at each end by axled roll ends 8,9. One core end 9 has a gas line connector 10 through which gas under pressure may be introduced to ducting 13 inside the volume enclosed by the tube 7 and ends 8,9. Gas can only escape from this radially through radial ports 18 in a block 17 which lead to outlets 12 circumferentially spaced apart around the core in a plane remote from both axial ends of the working length of the core, and

preferably in the region of the middle of the axial length of the core 6. The radially outer surface 11 of the tube 7 has a progressive change in diameter between its ends complementary to that of the surface 5 of the shell 2.

The features of the sleeve 1 described so far are identical to those of the first embodiment described in GB 1,581,232. However, a distinguishing feature of the core 6 is the keyway 100. This is a slot or groove provided in the outer surface 11 of the tube 7. It extends for the full length of the tube 7 parallel to the axis. It passes midway between an adjacent pair of outlets 12. The sleeve 1 has a corresponding key 101 extending for its full length.

In the form shown in Fig. 3 the keyway 100 is a groove of arcuate cross-section, and the key 101 is a precisely fitting complementary rib running the full length of the internal surface of the sleeve 1.

In the alternative form shown in Fig. 4, the keyway 102 has parallel sides 104. Similarly, the key 105 has parallel sides 106. The depth of the keyway 102 is slightly greater than the radial extent of the key, so that there is a slight clearance between the base of the keyway and the key. This together with the parallel sides ensures that the key 105 can be received wholly within the keyway 102, with practically no danger that incomplete entry would disrupt the circular symmetry of the outer surface 4 of the sleeve 1.

To fit the sleeve 1 onto the core 6, the end of the sleeve having the inner surface 5 of larger diameter is

aligned with the narrower end of the core 6, with the key 101 or 105 in line with the keyway 100 or 102. Then generally as disclosed in GB 1,581,232, the sleeve is passed over the core until it covers all of the gas outlets 12 and wedges against the core. The sleeve is then expanded by means of gas passed through the outlets 12, and pressed further onto the core, to its working position as shown in Fig. 1. When the gas pressure is released, the sleeve holds itself firmly in stressed condition on the core in its working position, ready for use. Any slight tendency that there may be for the sleeve to undergo rotational movement relative to the core is restrained by the key engaged in the keyway.

It will be appreciated that, in most respects, the construction and materials of the printing roll may be as disclosed in GB 1,581,232. Of course, the invention is not limited to constructions generally as shown there. We would for example refer to EP 9360 and GB 2,051,681 as further examples of printing rolls to which the concept of the present invention could be applied. Of course, the invention is more widely applicable. It is not restricted to cores or sleeves whose diameters vary along their lengths, or to printing rolls having sleeves arranged to be fitted by means of compressed gas.

The printing sleeve 1 is preferably made from glass fibre reinforced resin, with a metal outer surface which is etched or etchable in conventional manner to provide a gravure printing surface.

CLAIMS

1. A printing roll with a detachable sleeve, comprising a core (6) and a sleeve (1), characterised in that complementary formations (100,101;102,105) are provided one on the sleeve and the other on the core, which are engageable on passing the sleeve onto the core, and which act to prevent relative rotation of the sleeve and core.

2. A printing roll according to claim 1 wherein the sleeve (1) is a gravure printing sleeve with an etched or etchable metal outer surface.

3. A printing roll according to claim 1 or claim 2 wherein the sleeve (1) is slightly tapered internally and the core (6) has a complementary taper with apertures intermediate its ends for applying fluid under pressure to expand the sleeve for fitting and removal lengthwise of the core.

4. A printing roll according to any one of claims 1, 2 and 3 wherein the formations comprise a key (101;105) and a keyway (100;102).

5. A printing roll according to claim 4 wherein the key (101;105) is provided by the sleeve (1), and the keyway (100;102) is provided by the roll core (6).

6. A printing roll according to claim 4 or claim 5 wherein the keyway (100;102) is a slot or groove which runs the whole axial length of the roll.

7. A printing roll according to claims 4, 5 or 6 wherein the keyway (100) has an arcuate cross-section.

8. A printing roll according to claims 4, 5, 6 or 7 wherein the key (101) is a complementary rib to the keyway (100), with a cross-section that fits precisely into the keyway.

9. A printing roll according to claims 4, 5 or 6 wherein the key (105) and keyway (102) are parallel sided (104,106), the keyway being a slot slightly deeper than the height of the key.

10. A printing sleeve designed to fit a core, characterised in that the sleeve is provided with a formation (101;105) on its internal surface so as to be engageable with a complementary formation (100;102) on the core (6) on passing the sleeve onto the core, the formations acting to prevent relative rotation of the sleeve and core.

11. A printing sleeve according to claim 10 having an etched or etchable metal outer surface for gravure printing.

12. A printing sleeve according to claim 10 or claim 11 wherein the formation on the sleeve is an inwardly projecting key (101;105).

13. A printing sleeve according to claim 12 wherein the key (101) is of arcuate cross-section.

14. A printing sleeve according to claim 12 wherein the key (105) is parallel sided (106).

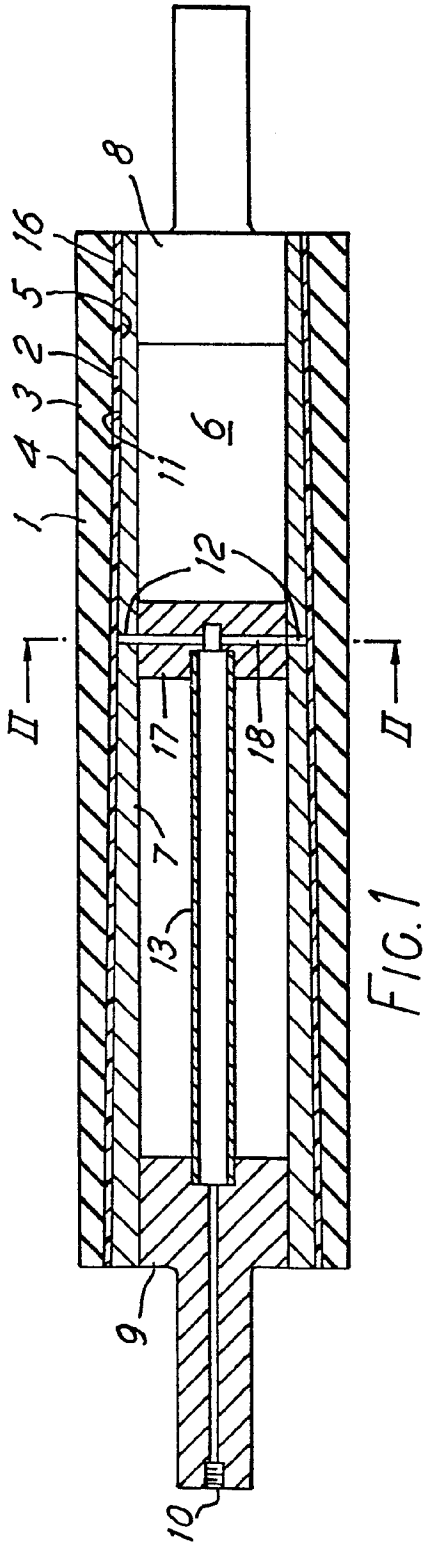

FIG. 1

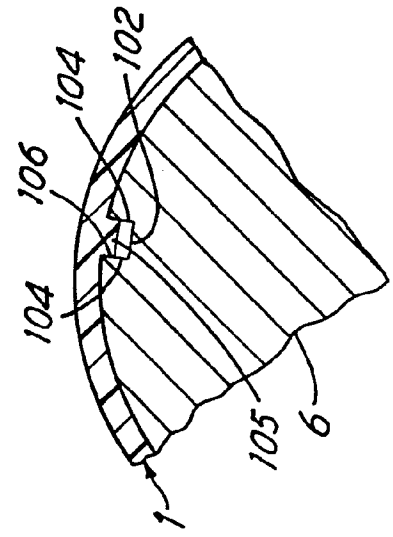

FIG. 4

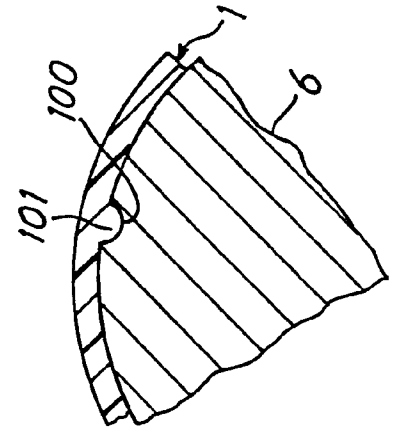

FIG. 3

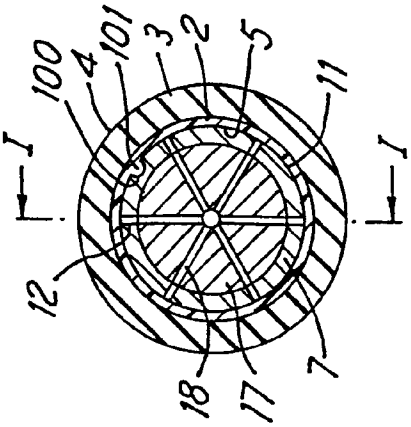

FIG. 2