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Minall et al.

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[54] **FILAMENT FEEDING APPARATUS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **226/109;** 226/150; 226/155

[51] **Int. Cl.** **B65h 17/22**

[58] **Field of Search** 226/141, 142, 154, 155, 226/156, 157, 149, 150, 109; 300/4

[56] **References Cited**

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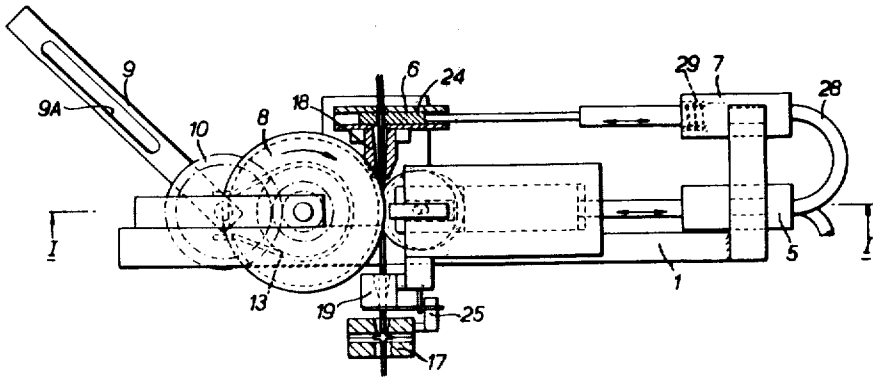
[57] **ABSTRACT**

Apparatus for feeding brush-filling material in continuous filaments to a brush-filling tool comprises a driven feed roller and two or more idler rollers each urged by an operating mechanism into engagement with the feed roller so as to hold a filament or bundle of filaments in engagement with the feed roller. Movement of the filament or bundle of filaments is prevented by a brake during non-feeding periods.

9 Claims, 5 Drawing Figures



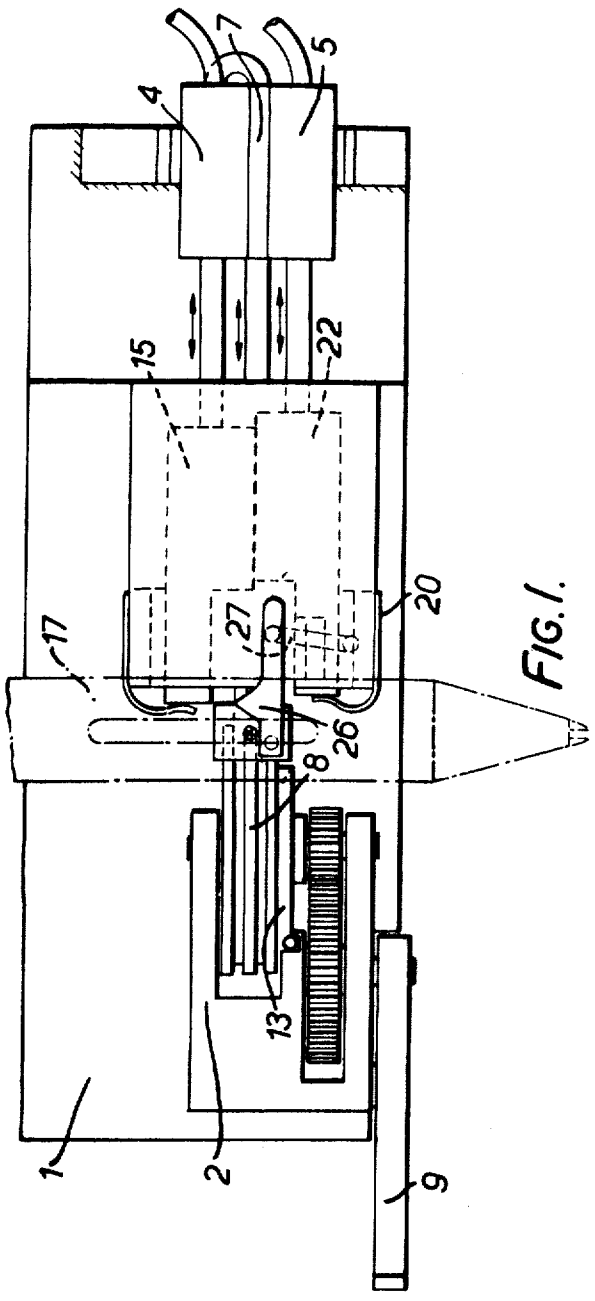


FIG. 1.

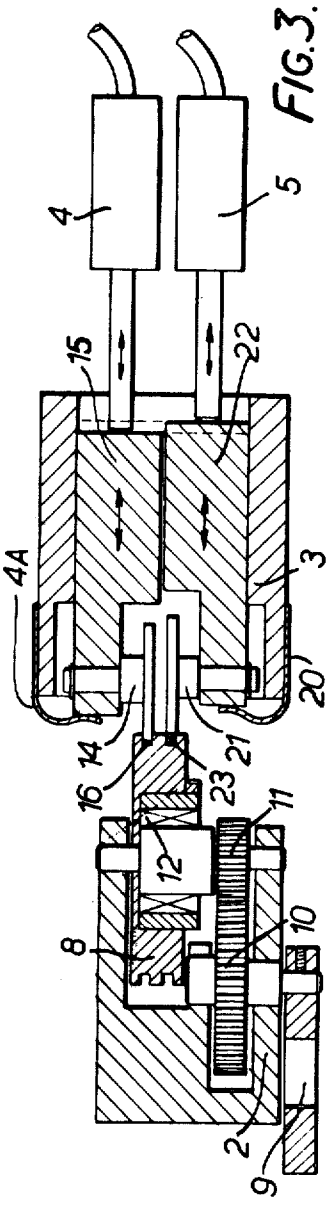


FIG. 3.

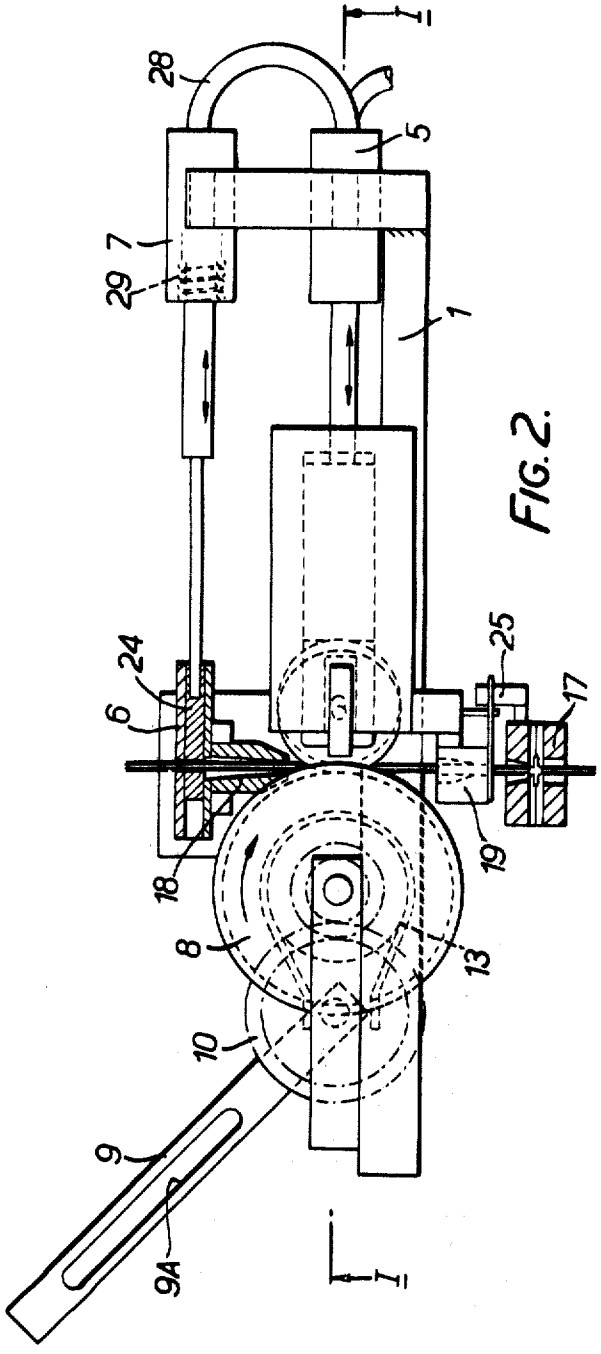


FIG. 2.

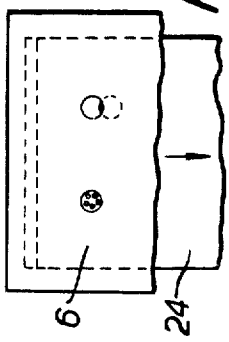


FIG. 5.

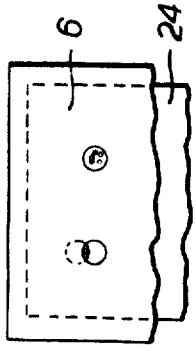


FIG. 4.

FILAMENT FEEDING APPARATUS

This invention relates to apparatus for feeding brush-filling material in continuous filaments to brush filling machinery.

In the making of brushes it is sometimes desirable that some tufts shall be of a different material or colour or have a different bristle thickness or number of bristles from other tufts in the same brush.

According to the present invention an apparatus for feeding brush-filling material to a brush-filling tool, in combination

1. a feed roller means with at least two separate circumferential material feed paths thereon,

2. drive means for rotating the feed roller a predetermined amount in a feeding direction,

3. at least two idler rollers each positioned to engage a different one of the feed paths to hold material in frictional engagement with the feed roller when that material is to be fed,

4. means for selectively moving each roller into and out of engagement with the feed paths so as to feed material thereon, and

5. braking means for restaining movement of materials when not being fed.

Preferably there are circumferential grooves in the feed roller and/or the idler rollers for guiding the material. In a preferred arrangement the feed paths comprise grooves in the feed roller means and each idler roller is narrow enough to enter a respective groove. The feed roller means may be a composite arrangement of a plurality of individual rollers spaced along, and rotatable with a common shaft.

The drive means may include an oscillatable lever linked to the feed roller means via a one-way clutch. By varying the amplitude of oscillation of the lever the amount of rotation of the feed roller means in the feeding direction can be varied. For example the lever may have an elongate slot in which is received a pin at one end of a connecting rod driven by a crank or eccentric, the position of the pin in the slot determining the amount of rotation of the feed roller means. Preferably there is a brake for inhibiting over-run and backward rotation of the feed roller means.

Preferably the means for urging each idler roller towards the feed roller means comprises a fluid-operable actuating cylinder, and each idler roller is resiliently biassed away from the feed roller means.

The braking means may comprise abutting parallel plates having co-operating holes for the feed material braking being effected by relatively displacing the plates so as to produce partial mis-alignment of the holes. Preferably one plate is fixed and the other is movable by a fluid-operable actuating cylinder. Where the apparatus is for feeding two sets of feed material two plates may be used, each plate having two holes therein and the holes being so arranged that in one relative position of the plates one pair of holes coincides whilst the other pair of holes is partially mis-aligned and so that in another relative position of the plates the one pair of holes is partially mis-aligned whilst the other pair of holes coincides.

By way of example only, material feeding apparatus in accordance with the invention and associatd with a brush filling tool will now be described with reference to the accompanying drawings of which:

FIG. 1 is a side elevation of the apparatus with the horizontally disposed filling tool shown in chain dotted outline,

FIG. 2 is a part sectional plan view with the filling tool and a material brake shown in section,

FIG. 3 is a part-sectional side elevation of the line I — I of FIG. 2 omitting the material brake, and

FIGS. 4 and 5 are fragmentary side elevations showing detail of the material brake.

Referring to the drawings a carrier plate 1 supports a feed roller housing 2, an idler roller housing 3, idler roller loading cylinders 4, 5, a material brake guide 6 and a material brake cylinder 7. A feed roller 8 carried in the housing 2 is arranged to be indexed in a clockwise direction as seen in FIG. 2 by oscillation of a drive lever 9 driving through gears 10, 11 and a sprag clutch 12. A connecting rod (not shown) is attached at one end to the drive lever 9 and at the other end follows an eccentric rotated by the machine of which the brush filling tool is a part. A slot 9A in the drive lever 9 permits the amplitude of movement of the lever to be varied for a given eccentric throw, thus enabling the amount of rotation of the feed roller 8 at each index to be varied. A brake 13 inhibits over-run of the feed roller 8 and also backward rotation of the feed roller when the sprag clutch is being returned.

An idler roller 14 carried on a slide 15 is movable towards the drive roller 8 by pressurising the loading cylinder 4 against the returning action of a leaf spring 4A, thus casuing a bundle of bristles 16 to be pressed against the drive roller 8 and driven downwards (as seen in FIG. 2) into the filling tool 17 by indexing of the drive roller. The bristles are continuous artificial filaments which are fed from drums (not shown) and are guided onto the drive roller by a guide 18 and into the brush filling tool 17 by a guide 19. The apparatus is arranged to feed bundles of two different types of bristle so that a brush stock operated on by the tool can be filled partly with tufts of one bristle material and partly with tufts of the other bristle material. When the tool 17 is to be charged with the other type of bristle the loading cylinder 4 is opened to exhaust and the loading cylinder 5 is pressurised to force an idler roller 21, carried on a slide 22, against a second bundle of bristles 23. Indexing of the feed roller 8 will now cause this second bundle of bristles to be fed into the tool 17.

Referring especially to FIGS. 2, 4 and 5 a material brake consists of a plate 24 slidable relative to the brake guide 6, the plate 24 and the guide 6 each have two holes therein. As seen in FIG. 4, in one position of the plate 24 relative to the guide 6 one pair of holes coincides leaving the bristles passing therethrough free to be driven by the drive roller 8 and the other pair of holes is mis-aligned so clamping the bundle of bristles passing therethrough and preventing movement of the bundle when freed by the idler roller. In the other relative position of plate and guide as shown in FIG. 5 the arrangement is reversed in that the bundle previously clamped is freed and the bundle previously free is clamped. As shown in FIG. 2 the brake plate 24 can be moved to the left by pressurisation of brake cylinder 7 and can be moved to the right by a compression spring 29 when cylinder 7 is depressurised. Cylinder 7 is connected to cylinder 5 by a pipe 28 so that the bundle of bristles 16 is freed by the brake when cylinder 5 is pressurised, and so that the other bundle of bristles 23 is freed by the brake when cylinder 4 is pressurised.

Operation of cylinders **4, 5** and **7** is in timed sequence with a pattern cam and the filling tool of the brush filling machine so that a whole brush stock can be filled with any desired pattern and combination of tufts.

When a bundle of bristles has been fed into the tool **17** a knife blade **26** is tripped by an actuating block **25** carried by the filling tool **17** and severes the bristles leaving a tuft of desired length in the filling tool. A spring **27** returns the knife blade **26** to its rest position when the filling tool advances and the actuating block **25** clears the knife blade.

The amount of movement of the drive roller **8** on each index determines the length of cut bristle. Where the adjustment of length provided by the slot **9A** in the drive lever **9** is insufficient the gears **10, 11** can be changed for others giving a different ratio.

It will be appreciated that providing further idler rollers and actuating cylinders and extending or duplicating the drive roller will enable three or more bristles or bundles of bristles to be fed by apparatus in accordance with the invention. To achieve a compact layout some or all of the additional idler rollers may be disposed on a different axis or axes from the one occupied by the two idler rollers shown in the drawings.

We claim:

1. Apparatus for feeding brush-filling material to a brush-filling tool comprising in combination

1. a feed roller means with at least two separate circumferential material feed paths thereon,
2. drive means for rotating the feed roller a predetermined amount in a feeding direction,
3. at least two idler rollers each positioned to engage a different one of the feed paths to hold feed material in frictiional engagement with the feed roller when that material is to be fed,
4. means for selectively moving each roller into and out of engagement with the feed paths so as to feed material thereon, and
5. braking means for restraining movement of material when not being fed.

2. Apparatus according to claim **1**, wherein the feed paths are circumferential grooves in the feed roller means for guiding the material, and each idler roller is adapted to enter a respective groove.

3. Apparatus according to claim **1**, wherein the drive means includes an oscillatable lever linked to the feed roller means via a one-way clutch.

4. Apparatus according to claim **3**, wherein means is provided for varying the amplitude of oscillation of the lever.

5. Apparatus according to claim **3**, wherein the lever is arranged to be driven by a crank or eccentric via a connecting rod.

6. Apparatus according to claim **1**, wherein there is a brake for inhibiting rotation of the feed roller means when the latter is not being driven.

7. Apparatus according to claim **1**, wherein each idler roller is resiliently biassed away from the drive roller and a fluid operable actuator is provided for urging each idler roller towards the drive roller.

8. Apparatus according to claim **1**, wherein the braking means comprises relatively movable abutting parallel plates having co-operating holes for the material.

9. Apparatus according to claim **8** for feeding two filaments or bundles of filaments wherein the braking means uses two plates, each plate having two holes therein and the holes being so arranged that in one relative position of the plates one pair of holes coincides whilst the other pair of holes is partially misaligned and in another relative position of the plates the one pair of holes is partially mis-aligned whilst the other pair of holes coincides.

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