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# Improving spinning performance

# and

# perforated roller rigidity

Improvements relating to open end friction spinning machines.

The present invention relates to apparatus for open end friction spinning of yarns of the type in which two rollers are driven in the same rotational direction and are adjacently arranged such that their surfaces form a wedge-shaped gap. Fibres from a fibre opening device are conveyed through a fibre transfer passage and deposited on one or both of the roller surfaces and embodied into a yarn formed in the said gap. At least one of the rollers has holes in its peripheral surface through which air is drawn by a suction device within the roller thereby creating a suction in the gap.

More particularly, the invention relates to improvements in the perforated rollers and the slotted tube positioned inside the perforated roller which communicates suction to the perforated roller for spinning machines of this type. Known systems of this type have been disclosed in British patents 2 023 196 and 2 074 201 and United States patent 4,628, 679.

In operating apparatus of this type it is difficult to satisfy the conflicting interests of stability of the apparatus and process with the need to draw sufficient air through the perforated section of the roller.

According to a first aspect of the invention there is provided a rotatable roller for use on an open end friction spinning machine for producing yarns, said roller having holes defining a perforated section in the periphery of the roller, and suction means within the roller effective to draw

air through the holes, wherein the thickness of the material over the perforated section of the roller is greater at the end of the perforated section of the roller in which the tail of the yarn is formed than at the end from which the fully-formed yarn is withdrawn.

According to a second aspect of the invention there is provided apparatus for open friction spinning of yarns including a roller, said roller having holes defining a perforated section in the periphery of the roller, and suction means within the roller effective to draw air through the holes, wherein the thickness of the material over the perforated section of the roller is greater at the end of the perforated section of the roller in which the tail of the yarn is formed than at the end from which the fully-formed yarn is withdrawn.

It has been found that, not only does this result in a more rigid roller than if the thickness of the material over the whole length of the perforated section of the roller was substantially the same, but also, surprisingly, the volume of air drawn through the perforated roller is reduced by an amount less than expected. Most surprisingly, the frequency of yarn breaks during operation reduces very significantly.

The invention is illustrated by way of example in the accompanying drawings in which :-

Figure 1 is a sectional view of a first embodiment of the invention taken through the centre of the slot in the tube which communicates suction to the perforated roller.

Figure 2 is an illustration of the components which form

part of the apparatus shown in Figure 1.

Figure 3 is an illustration of a section through the centre of the perforated roller shown in Figure 2 exposing the inside surface of the perforated roller.

Figure 4 is a sectioned view of apparatus similar to that shown in Figure 1, but providing an alternative method of assembling the components.

Figure 5 is a sectioned view of a second embodiment of the invention.

Figure 6 is an illustration of the components which form part of the apparatus shown in Figure 5.

Figure 7 is an illustration of a section through the centre of the perforated roller shown in Figure 6.

Figures 8, 9, 10 and 11 show the arrangement of the holes in the perforated section of the roller in greatly enlarged form of apparatus referred to in Figures 1 and 5.

In a first embodiment, referring to Figures 1, 2 and 3, yarn Y is formed in the wedge shaped gap between the adjacently arranged perforated roller 1 and imperforate roller 34.

The perforated roller 1 is mounted on a stationarily arranged suction tube 4 by front bearing 5 and rear bearing 6. The front bearing 5 is located at its outside diameter 24 on face 2 of perforated roller 1, and at its inside diameter 25 on solid front shaft 7 and located against face 22 of tube 4. Rear bearing 6 is located at its outside diameter 26 on face 3 of perforated roller 1, and at its inside diameter 27 on rear part 8 and against face 23 of tube 4. The imperforate

roller 34 is supported on bearings 13a and 13b.

Suction is communicated from a source (not shown) through interior 28 of tube 4, which is then transmitted through slots 9 and 10 and through holes 18 and 19 in the roller 1. The external face 21 of slot 10 is closely adjacent internal face 12 of perforated roller 1, so that suction through holes 18 holds part Y1 of the yarn Y against outside face 17 of perforated roller 1. The external face 20 of slot 9 is closely adjacent internal face 11 of perforated roller 1, so that suction through holes 19 holds part Y2 of the yarn Y against outside face 16 of perforated roller 1.

To assemble the components together the front face 14 of tube 4 is passed internally through the rear face 30 of perforated roller 1, passed through face 31 until face 32 of tube 4 is in the correct position relative to face 31 of perforated roller 1. A requirement of the apparatus is that the maximum dimension of tube 4, which is the distance between external face 20 of slot 9 and external face 29, is less than the minimum internal diameter of perforated roller 1 which occurs at internal face 12 and that the clearance between face 15 of perforated roller 1 and face 33 of tube 4 is sufficient to allow face 33 to pass inside face 15 when the slot 9 is still located within internal face 12 of perforated roller 1.

The front bearing 5 is then pressed over solid shaft 7 of tube 4 and into bore 2 of perforated roller 1, and rear bearing 6 is pressed over outside diameter 8 of tube 4 and

into bore 3 of perforated roller 1 until front bearing 5 locates against faces 22 and 65 and rear bearing 6 locates against face 23 and is clear of, but adjacent to, face 40.

A characterising feature of the apparatus according to the invention is that the length of the holes 18 in perforated section adjacent slot 10, determined by the distance between outside face 17 and inside face 12, is significantly greater than the length of the holes 19 in perforated section adjacent slot 9 determined by distance between outside face 16 and inside face 11.

In the embodiment shown, slots 10 and 9 in tube 4 are substantially equal in length, separated by section 51 and the section 52 of the perforated roller 1, closely adjacent section 51, is not perforated. However, it is within the scope of the invention that slots 10 and 9 could be dissimilar in length and that the two slots could be joined together without the need for section 51 and also that section 52 could be perforated. It is also within the scope of the invention that there could be more than two slots with a corresponding number of different hole depths in the perforated roller.

As shown in Figure 4, an alternative method of assembling the components can be employed if the front bearing 35 is selected such that the internal diameter of perforated roller 45 at face 36 is greater than the maximum dimension of tube 4, which is the distance between external face 20 of slot 9 and external face 29 of tube 4. In this arrangement, rear end 37 of tube 4 is passed internally through perforated

roller 45 from front end face 38 until rear end 37 extends beyond rear face 30 of perforated roller 45. Front bearing 35 is then pressed over solid shaft 7 of tube 4 and into bore 39 of perforated roller 45 and rear bearing 6 is pressed over outside diameter 8 of tube 4 and into bore 3 of perforated roller 45 until front bearing 35 locates against faces 22 and 53 and rear bearing 6 locates against face 23 and is clear of, but adjacent to, face 40.

In a second embodiment as shown in Figures 5, 6 and 7, suction is communicated from a source (not shown) through interior 42 of tube 41 which is then transmitted through slot 43, the external face 54 of which is closely adjacent the internal face 44 of perforated roller 46, and then through holes 47 to hold yarn Y3 against outside face 48 of perforated roller 46.

A characterising feature of the apparatus according to the present invention is that the length of the holes 47 in the perforated section adjacent end face 49 of slot 43 is significantly greater than the length of holes 47 adjacent to end face 50.

The method of assembling the components together is similar to that of the first embodiment shown in Figures 1 and 2, although it is within the scope of the invention that the alternative method as shown in Figure 4 could also be applied to this second embodiment.

The holes in the perforated roller of apparatus referred to in Figures 1 and 4 are shown (in greatly enlarged form) in

Figure 8, and the holes in perforated roller of apparatus referred to in Figure 5 are shown in Figure 9. The cross section of the holes 18 and 19 (Figure 8) and 47 (Figure 9) is substantially constant over the hole length from outside faces 16 and 17 to inside faces 11 and 12 in Figure 8 and from outside face 48 to inside face 44 in Figure 9. Although in the views shown the hole diameter is the same over the full length of the perforated section it is within the scope of the present invention that the diameter and spacing of the holes is different at different positions along the length of the perforated section of the roller.

Figure 10 shows an alternative arrangement of holes to that shown in Figure 8, and Figure 11 shows an alternative arrangement of holes to that shown in Figure 9.

Referring to Figure 10, the cross sectional area of the holes 58 at the outside face 55 of the perforated roller is substantially the same as at the inside face 56, but the cross sectional area of the holes 59 at outside face 55 is greater than that at inside face 57.

In the embodiment shown, the cross sectional area of the holes 58 is the same as the cross sectional area of the holes 59 at outside face 55, but, alternatively, the cross sectional area of the holes 58 could be the same as that of holes 59 at inside face 57. It is within the scope of the invention that the cross sectional area of the holes 58 could be different from the cross sectional area of holes 59 at either outside face 55 or inside face 57.

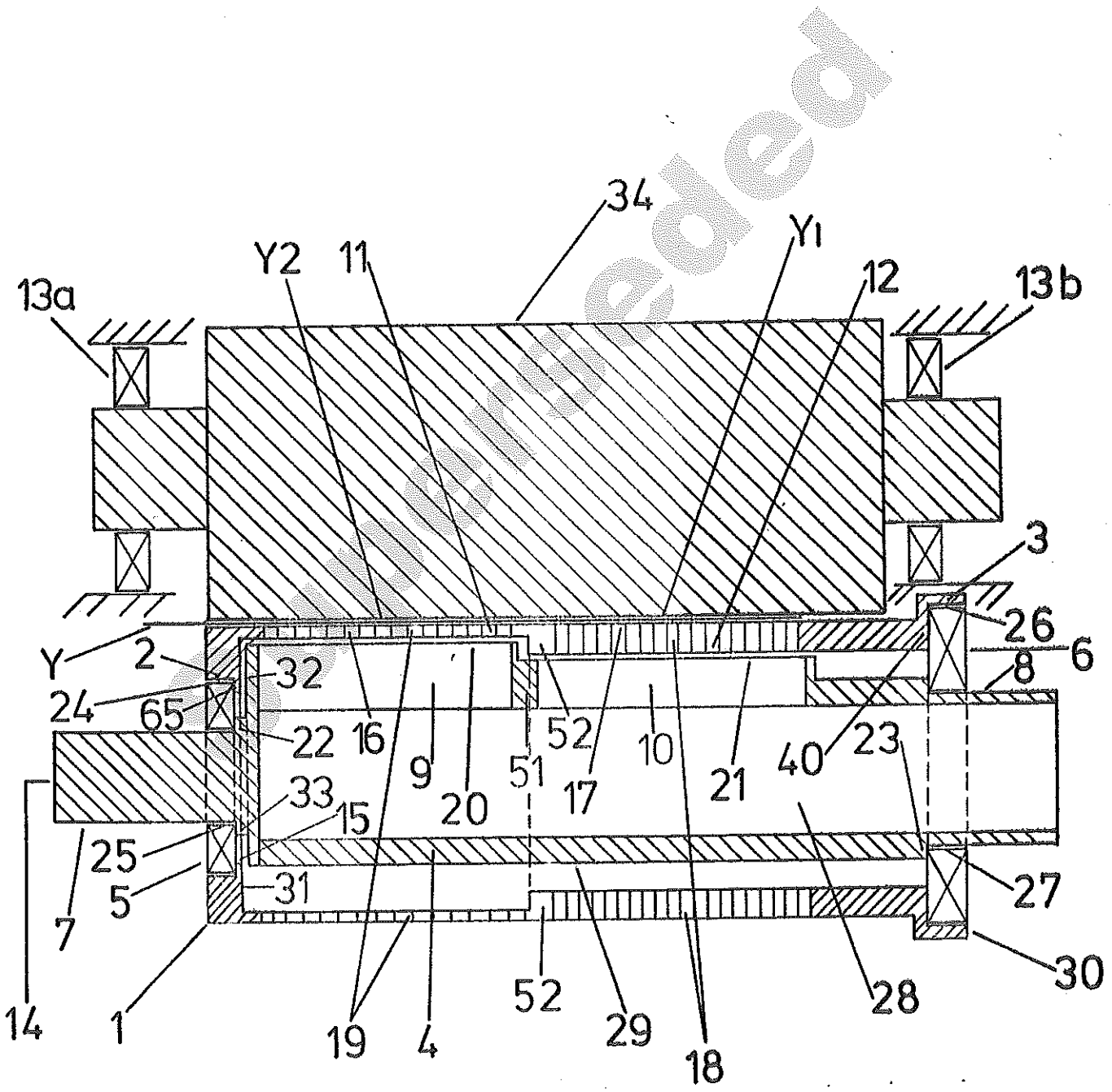
Referring to Figure 11, the cross sectional area of the

holes 60 at the outside face 61 of the perforated roller is substantially the same as at the inside face 62 which, referring to Figure 5, is adjacent face 50 of slot 43 in tube 41, whereas referring to Figure 11, the cross sectional area of the holes 63 at the outside face 61 of the perforated roller is greater than at inside face 64, which, referring to Figure 5, is adjacent face 49 of slot 43 in tube 41.

In the embodiment shown the cross sectional area of the holes 60 is the same as the cross sectional area of the holes 63 at outside face 61, but alternatively, the cross sectional area of holes 60 could be the same as that of holes 63 at inside face 64. It is within the scope of the invention that the cross sectional area of the holes 60 could be different from cross sectional area of holes 63 at either outside face 61 or inside face 64.

In a further arrangement the change in form of the holes from 60 to 63 can occur, referring to Figure 5, either part way between face 50 and face 49 of slot 43 in tube 41, or alternatively, referring to figure 11, the cross section of holes 63 at internal face reduces in stages from internal face 62, adjacent face 50 (Figure 5) to internal face 64, adjacent face 49 (Figure 5).

In a still further arrangement the cross section of holes 63 at external face 61 increases in stages from face 50 to face 49 (Figure 5).


34
Y2
11
Y1
12
13a
13b
3
26
Y
2
6
8
32
24
65
22
16
52
10
23
9
51
40
33
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31
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14
1
19
4
52
29
28
18

FIGURE 1

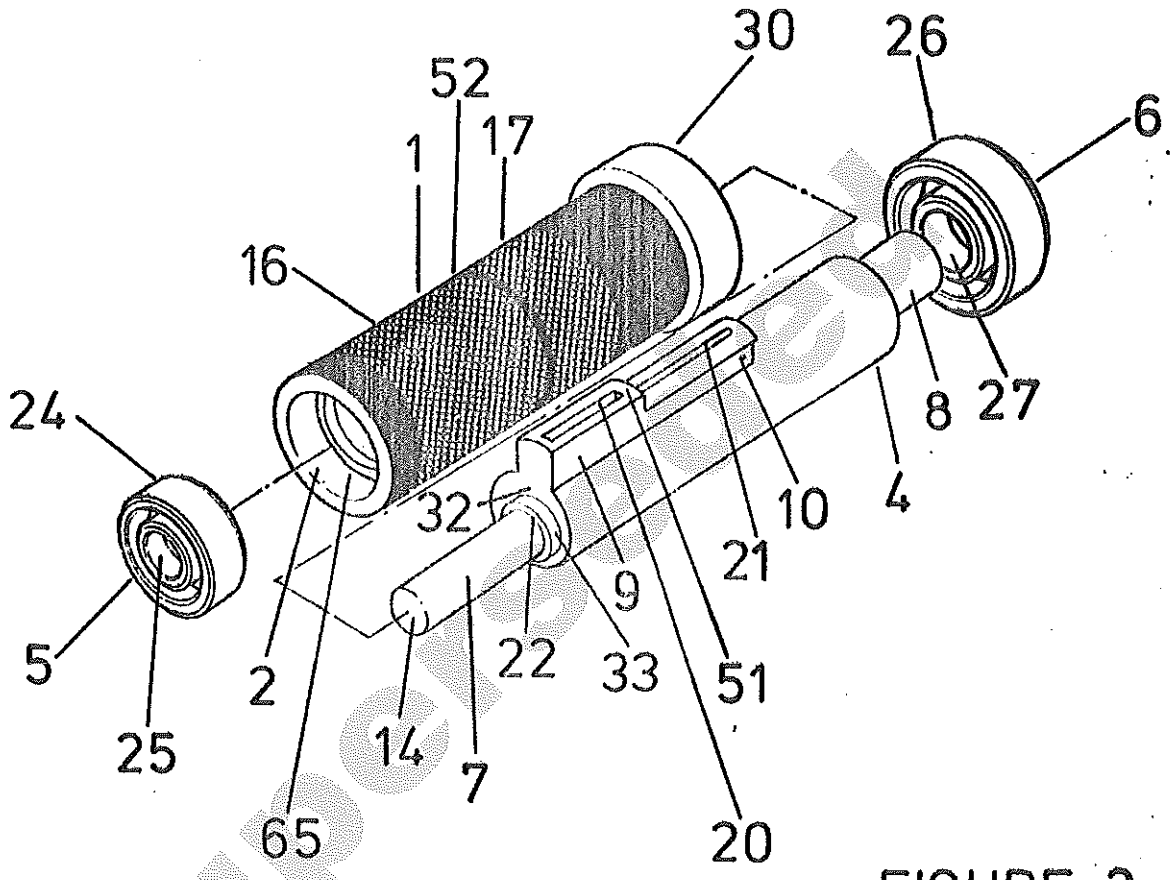


FIGURE 2

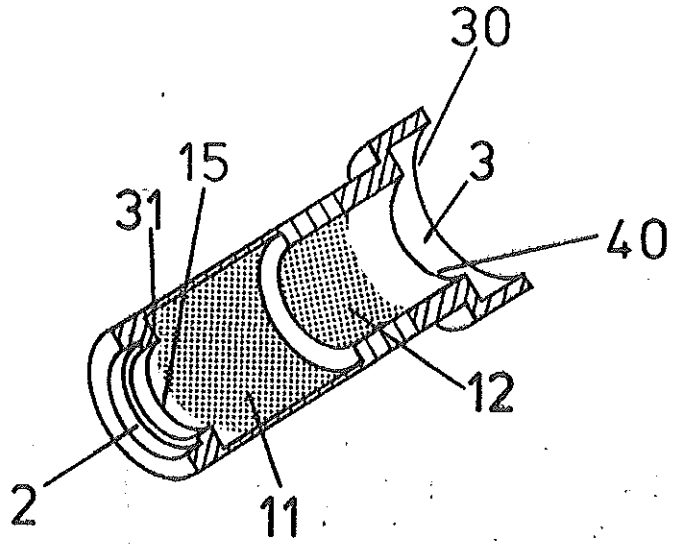


FIGURE 3

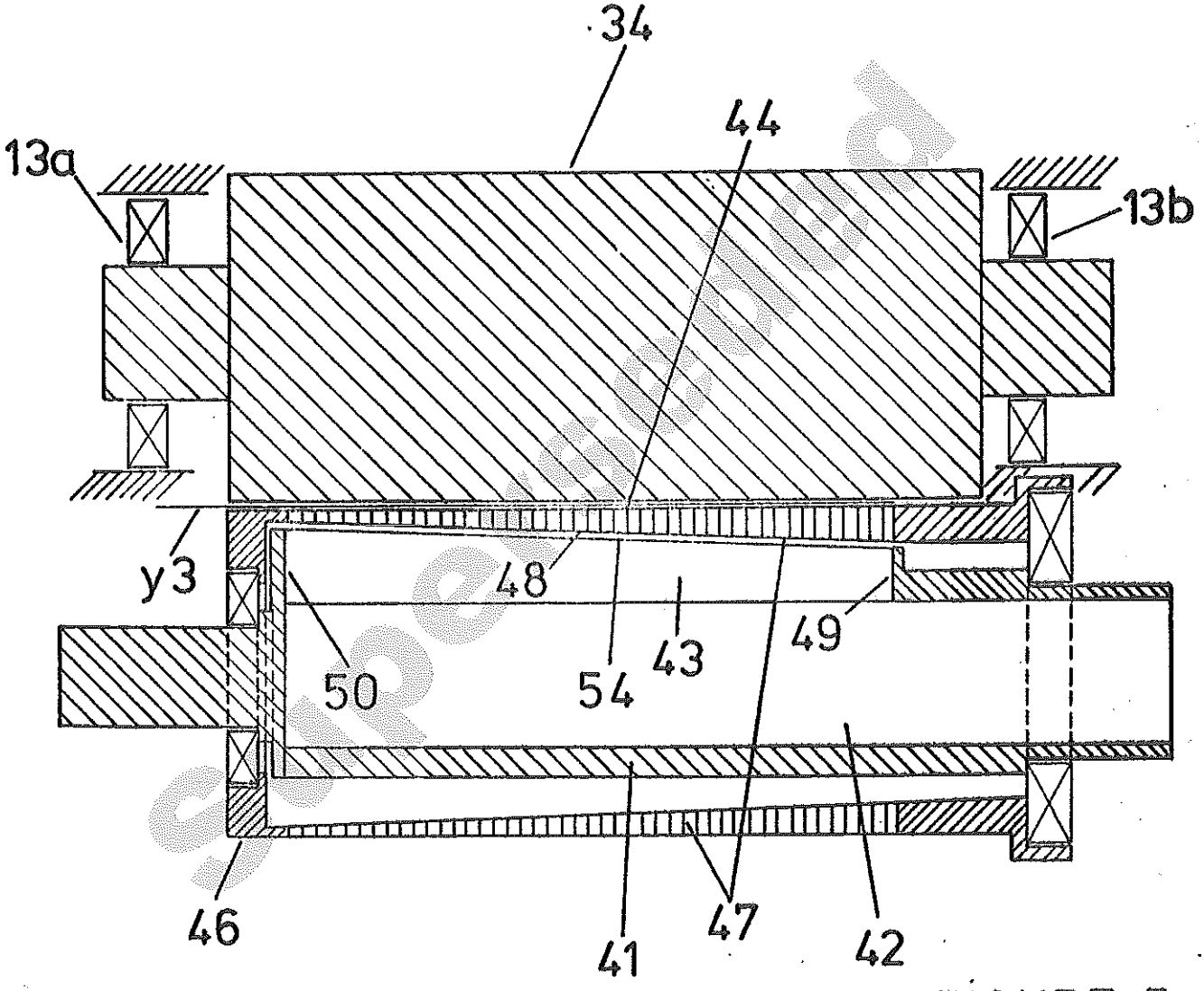


FIGURE 5

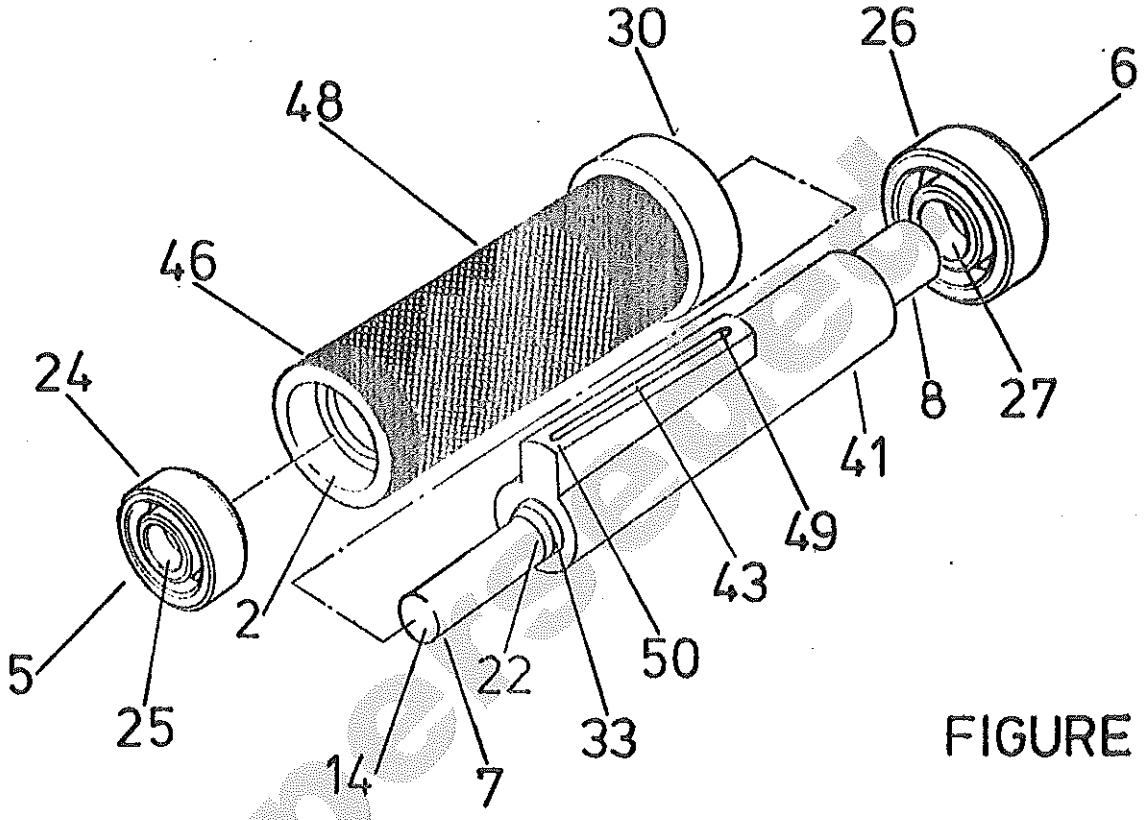


FIGURE 6

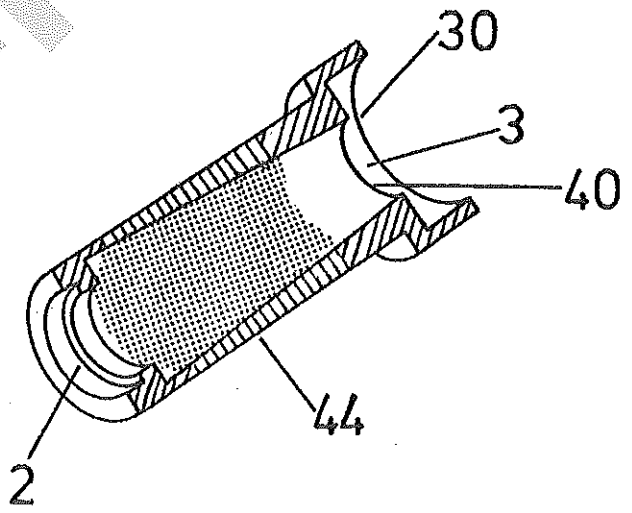


FIGURE 7

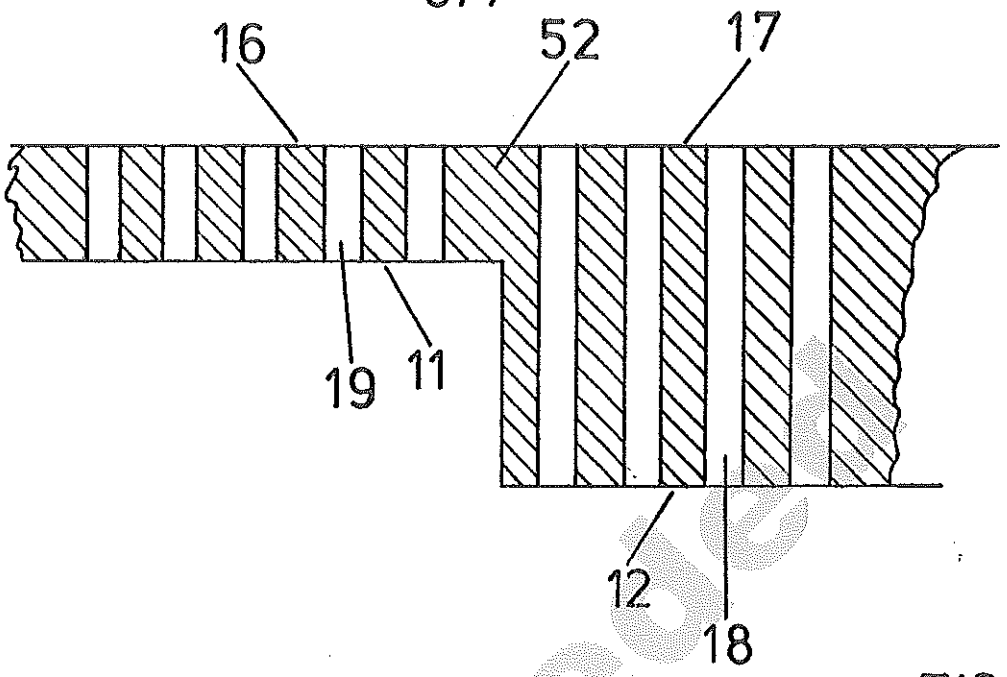


FIGURE 8

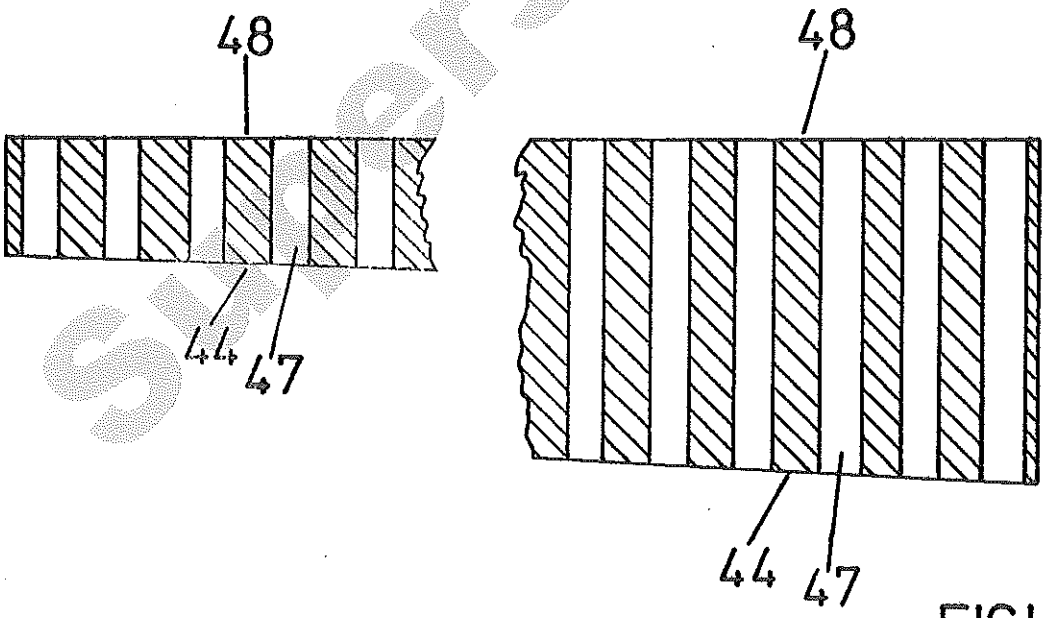


FIGURE 9

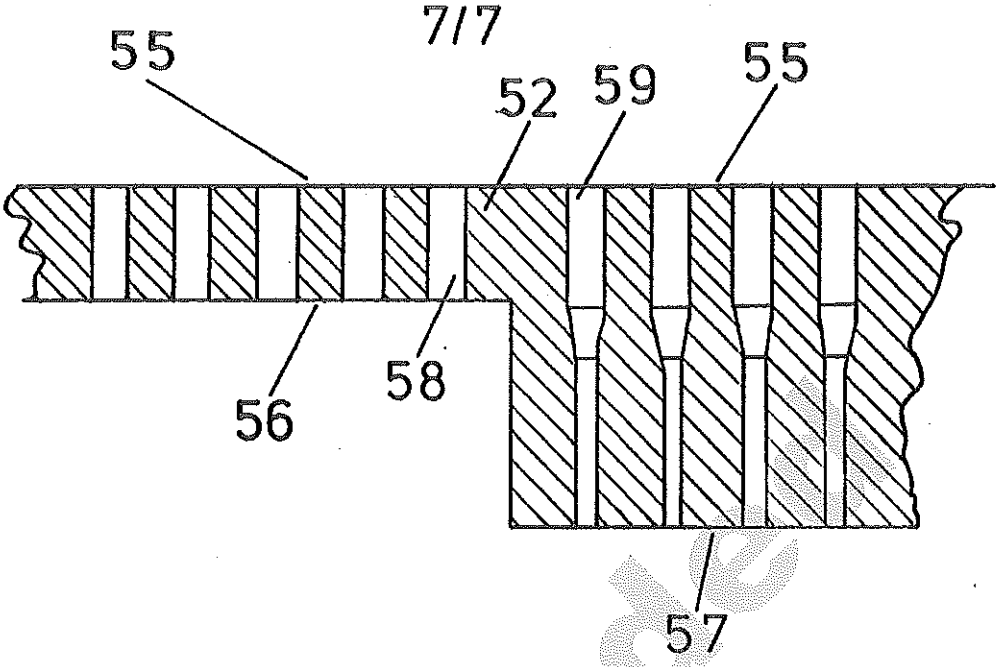


FIGURE 10

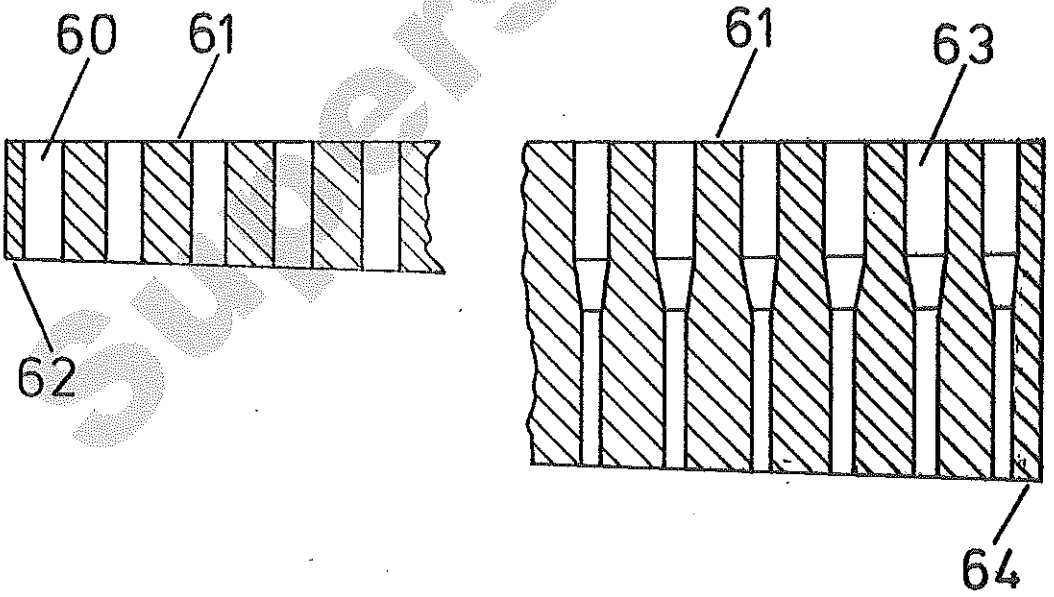


FIGURE 11