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Yarn heating assembly.

The invention provides a heating assembly (40) suitable for heating a yarn (11) during a texturing process, in which the yarn (11) is guided by guides (15,16) adjacent the ends of the assembly (40) to travel therethrough without contact. The yarn (11) travels along a bore (13) in a heated body (10) of the assembly (40) which substantially surrounds the yarn (11), but has a threading groove (23) comprising a slot (20) communicating with the bore (13) and the outer surface of the assembly (40). One or more baffles (17) in, or at the ends of, the groove (23) restrict the entrainment of air along the groove (23) by the yarn (11). The baffle may be a stainless steel tube which is attached to a door (43) pivotally mounted on the assembly (40) to enter and close the slot (20), or the slot (20) may have a width at least at its inner (26) and outer ends which is just sufficient to allow threading of the yarn (11) into the assembly (40).

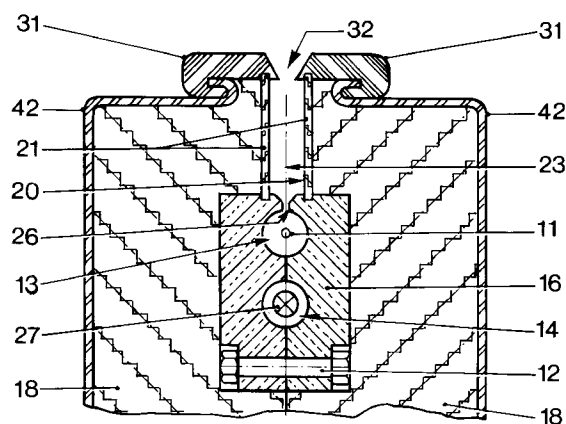


FIG. 4

This invention relates to yarn heating assemblies, and in particular to assemblies for heating a yarn during the false twisting stage of a yarn false twist texturing process. Such a heating assembly is described in British patent application No. 2250340, the heating assembly in that case comprising an elongate heated surface and yarn guide means disposed relative to each other in operation to provide a yarn path which extends adjacent the heated surface. The various embodiments of heater described in that application comprise a plurality of yarn guides disposed along a door of the heater to guide the yarn along the desired yarn path adjacent the heated surface when the door is in its closed, operational position. The plurality of yarn guides facilitate the provision of a curved yarn path adjacent a curved heated surface and/or the adjustment of the disposition of at least a part of the yarn path relative to the heated surface. The plurality of yarn guides also provide good support for the running yarn within the heater to prevent instability at the required yarn throughput speeds.

However, with the efficient and rapid heating of textile yarns by means of high temperature non-contact heaters of the type described in the above-mentioned application, shorter lengths of heater are required than was the case with lower temperature contact heaters used previously. It has been found that unsupported lengths of yarn can be heated successfully by relatively short high temperature non-contact heaters whilst avoiding instability of the running yarn at the required yarn throughput speeds.

It is known to heat a running yarn by passing it through a heated tube without the yarn contacting the inner surface of the tube. However, the threading of such a yarn heater presents difficulties which increase considerably the threading time and which can only be overcome with the use of threading aids, thereby adding to the running costs and the initial cost of a textile machine incorporating a tube heater. In addition, for efficient heating over the relatively short length of a high temperature heater, the bore of the tube should be of only slightly larger diameter than that of the yarn, which increases the risk of the yarn touching and being melted by the inner surface of the tube during running and particularly during threading.

It is an object of the present invention to provide a yarn heating arrangement which retains the advantages associated with a high temperature non-contact heater, but avoids the disadvantages associated with the use of a heated tube having a relatively small bore.

The invention provides a yarn heating assembly comprising an elongate heated body and having a groove extending therealong to provide a yarn path through the body, the groove comprising a bore which in cross-section substantially surrounds the yarn path and a slot communicating with the bore and

the outer surface of the heating assembly, guides disposed adjacent the ends of the groove to guide a yarn along the yarn path adjacent the surface of the bore, a heating device adapted to heat the body, and at least one baffle disposed in operation at the groove to restrict the flow of air along the yarn path. The slot may have a width which, at least in the region thereof which communicates with the bore, is a predetermined width sufficient only to allow the threading of a yarn therethrough.

The heating assembly may comprise a closing device disposed in operation substantially to close the slot, in which case the baffle may be integral with, or secured to, the closing device, and a plurality of baffles may be provided which project from the closing device and are mutually spaced longitudinally thereof. Alternatively, the baffle may comprise an elongate member secured to the closing device to extend longitudinally thereof, and may be spaced therefrom to provide an air gap therebetween. The baffle may be of a material having good heat reflecting properties, and the closing device may be of a material having good thermal insulating properties. The baffle may comprise a metal tube, and may be of stainless steel. The closing device may comprise a door which is pivotally mounted relative to the body so as to be movable between an open, threading position and a closed, operating position. The guides may be attached to the closing device so as to be movable therewith.

Alternatively, the slot may have a width, at the region which communicates with the outer surface of the heating assembly, which is the predetermined width.

Embodiments of the invention will be further described below with reference to the accompanying drawings in which

Fig. 1. is a side elevation of a first embodiment of yarn heating assembly,

Fig. 2. is a section on line 2-2 of Fig. 1.

Fig. 3. is an enlarged section corresponding to Fig. 2. of part of a second embodiment,

Fig. 4. is an enlarged section corresponding to Fig. 2. of part of a third embodiment,

Fig. 5. is a perspective view of the embodiment of Fig. 4., and Figs. 6 and 7. are enlarged sections corresponding to Fig. 4. of further embodiments.

Referring now to Figs. 1 and 2, there is shown a part of a textile machine 28 in which a heating assembly 40 is mounted. The machine 28 illustrated is a false twist texturing machine for texturing a yarn 11 and, in addition to the heating assembly 40, comprises a cooling plate 25 mounted on the frame 29 of the machine 28, and a first feed device 24 mounted on a creel 22.

The heating assembly 40 comprises an elongate heated body 10, which is formed in two halves secured to each other by screws 12, rivets or clips, and

has extending therealong a groove 23 in the form of a bore 13 and a slot 20. The bore 13 defines a path for the yarn 11 to travel through the heating assembly 40, which yarn path is adjacent the surface of the bore 13 and is substantially surrounded thereby. The body 10 has the bore 13, a "neck" part 26 of the slot 20 which communicates with the bore 13, and a second bore 14 extending therealong. An electric heating element 27 extends along the second bore 14 to heat the body 10 to the required temperature, for example in the range 300 to 800 C. In operation, the yarn 11 is guided by guides 15, 16 at the inlet and outlet end respectively of the heater 40 to travel along the bore 13 to be heated by the body 10. The body 10 is enclosed substantially by a thermal insulating material 18 which is also in two halves within a casing 19, and is formed to have a slot 20 in which the body 10 is located. The sides of the slot 20 are lined with linings 21 of a rigid insulating material, e.g. fibre board, which serve to retain the body 10 in its location at the bottom of the slot 20. A cover 22 closes the casing 19 and secures the heater 40 to the frame of the machine 28. A closing device or door 43 substantially closes the neck part 26, substantially fills the slot 20 and closes the outer end of the slot 20 during operation of the machine 28, and is pivotally mounted at pivot 44 provided on a door mounting bracket 57. The door 43 may be moved between a closed, operating position shown in Fig. 2. and in full lines in Fig. 1, and an open, threading position shown in broken lines in Fig. 1. When the door 43 and the first feed device 24 are in the open, threading position, the yarn 11 travels from the creel 22 through the open nip of the first feed device 24, over a guide pin 46 on the door mounting arm 45 and then to the false twist device (not shown) without entering the heating body bore 13 or contacting the cooling plate 25.

The door 43 comprises a closing plate 47 of a good thermal insulating material which is attached to the mounting arm 45, and which is of a thickness such that it will just enter the slot 20 in the cover 42, casing 19 and insulating material 18 substantially to close it. Projecting from the inner edge of the closing plate 47 are several posts 48 by means of which a baffle 17 is supported on the closing plate 47. The baffle 17 comprises a tube of heat reflecting material, such as stainless steel, which is of a diameter such that it almost closes the neck part 26 of the slot 20 and hence the bore 13 in the heated body 10. Clips 41 retain the baffle tube 17 on the posts 48 and spaced from the closing plate 47 so as to provide an air gap therebetween which reduces the transfer of heat from the baffle tube 17 to the closing plate 47. By this means, loss of heat from the bore 13 is minimised. The baffle tube 17 also serves to reduce considerably the flow of air longitudinally of the heater 40 in the region of the bore 13, whether caused by convection or by entrainment by the yarn 11, and such airflow reduction has been

found to increase the efficiency of heating the yarn 11 by an appreciable amount. The tube 17 may be closed at its ends to prevent airflow through it and consequential internal contamination.

In an alternative embodiment, the posts 48 are of a size and shape such that at each post position the neck 26 opening of the slot 20 into the bore 13 is almost closed so as to form baffles 17 whereby airflow longitudinally of the bore 13 is restricted.

In a further embodiment, shown in Fig. 3, the width of the neck part 26 is reduced, compared with that of Fig. 2, to a predetermined width sufficient only to allow threading of the yarn 11 therethrough, for example between 1.5 and 2.0mm.

Referring again to Figs. 1 and 2, also mounted on the closing plate 47, on opposed faces thereof, are two side members 49 which are joined to each other by slider pins 50 passing through slots 51 in the closing plate 47. A longitudinally extending lip 52 on one of the side members 49 is engaged by two cranked arms 53, each of which is pivotally mounted on the closing plate 47 at pivots 54, and is biased by a spring 55 to push the side members 49 to a position in which they lie on opposed sides of the baffle tube 17 to shield it and protect it from damage when the door 43 is in the open, threading position. Yarn guides 15, 16 are mounted also on the door 43.

When the door 43 is moved from the open, threading position, and the first feed device 24 is closed, the yarn engages the yarn guides 15, 16 and is moved to its operating position within the bore 13 and in contact with the cooling plate 25. As the door 43 closes and the yarn 11, the baffle tube 17 and the closing plate 47 enter the slot 20, the side members 49 come into contact with the cover 42 and are caused to slide relative to the closing plate 47 as slider pins 50 move along the slide slots 51 and arms 53 rotate against the force of the springs 55. A spring 56 extending between the door mounting bracket 57, mounted on the machine frame 29, and the door mounting arm 45, biases the door 43 towards the closed operating position. To retain the door 43 in either the open or closed position, a spigot 58 is provided on the door mounting arm 45, and is engageable in recesses in the rim of a locator plate 59 provided on the door mounting bracket 57 concentrically with the pivot 44.

Referring now to Figs. 4 and 5, there is shown a heating assembly 30 comprising a heated body 10 of similar construction to that shown in Fig. 3. The body 10 is substantially surrounded by heat insulating material 18 housed in a casing 19 and cover 42 similar to that described in relation to the previous embodiments. As in the previous embodiments also, a slot 20, having sides lined with linings 21 of fibreboard, communicates with bore 13 and the outside of the heating assembly 30. However, in this embodiment, the door 43 is replaced by a different formation of slot

20. A capping 31, conveniently a pultrusion, secures the fibreboard slot linings 21 relative to the cover 42 and provides an opening 32 which, as with neck 26, is reduced also compared with the width of the slot 20 of this and the previous embodiments, to the pre-determined width sufficient only to allow threading of the yarn 11 therethrough. The pultrusion cappings 31 reduce the transfer of heat by conduction from the fibreboard linings 21 to the cover 42, and the relatively small slot width at the neck 26 and opening 32 reduces heat loss by radiation or convection from the bore 13. The flow of air along the bore 13 or slot 20 is restricted in this embodiment by means of baffle plates 33 provided at each end of the heating assembly 30. The baffle plates 33 have a slot 34 of width similar to that of opening 32 and neck 26 aligned centrally with the slot 20, and an opening 35 aligned with the bore 13 and slightly enlarged compared with the slot 34 only to minimise the risk of contact between the yarn 11 and the baffle plate 33 due to ballooning or vibration during running.

Referring now to Figs. 6 and 7, there are shown two further embodiments which are similar to that described above and shown in Figs. 4 and 5, except that in these cases the block of brass forming the heated body 10 has been replaced by sheets of stainless steel formed to provide the bore 13 and to enclose one (see Fig. 6) or two (see Fig. 7) heating elements 27. Such assemblies are less costly than the previously described embodiment and reduce the mass of the heat sink whilst providing a high degree of heat reflection towards the yarn 11.

Alternative embodiments of yarn heating assembly in accordance with the invention will be readily apparent to persons skilled in the art. For example, the baffle 47 may be of a cross-section other than circular, and may be solid instead of tubular. In the event that it is desired that the yarn path be curved, individual baffles 48 may be provided and formed as yarn guides disposed in operation to be substantially equidistant from the longitudinally curved bottom of the groove 23. Particularly in such a case the cooling plate 25 may be curved upwardly and the yarn 11 run on the upper surface thereof as a means of reducing the angle of wrap of the yarn 11 around the guide 16 at the exit end of the heater 40 and entry of the cooling plate 25.

Claims

1. A yarn heating assembly(40) comprising an elongate heated body(10) and having a groove(23) extending therealong to provide a yarn path through the body(10), guides(15,16) disposed adjacent the ends of the groove(23) to guide a yarn(11) along the yarn path adjacent the surface of a bore(13), and a heating device(27)

adapted to heat the body(10), characterised in that the groove(23) comprises the bore(13) which in cross-section substantially surrounds the yarn path, and a slot(20) communicating with the bore(13) and the outer surface of the heating assembly(40), and at least one baffle(17) is disposed in operation at the groove(23) to restrict the flow of air along the yarn path.

2. A heating assembly according to claim 1, characterised in that the slot(20) has a width which, at least in the region (26) thereof which communicates with the bore(13), is a predetermined width sufficient only to allow the threading of a yarn(11) therethrough.

3. A heating assembly according to claim 1 or claim 2, characterised in that the assembly(40) comprises a closing device(43) disposed in operation substantially to close the slot(20), wherein the closing device(43) comprises a door(43) which is pivotally mounted relative to the body(10) so as to be movable between an open, threading position and a closed, operating position.

4. A heating assembly according to claim 3, characterised in that the closing device(43) comprises a plate(47) of a thickness such that it will just enter the slot(20) substantially to close it.

5. A heating assembly according to claim 3 or claim 4, characterised in that the assembly(40) comprises a plurality of baffles(17) which project from the closing device(43) and are mutually spaced longitudinally thereof.

6. A heating assembly according to claim 3 or claim 4, characterised in that the baffle(17) comprises an elongate member(17) secured to the closing device(43) to extend longitudinally thereof.

7. A heating assembly according to claim 6, characterised in that the baffle(17) is spaced from the closing device(43) to provide an air gap therebetween.

8. A heating assembly according to any one of claims 3 to 7, characterised in that the guides(15,16) are attached to the closing device(43) so as to be movable therewith.

9. A heating assembly according to claim 1 or claim 2, characterised in that the slot(20) has a width, at the region which communicates with the outer surface of the heating assembly(40), which is substantially the predetermined width.

10. A heating assembly according to claim 9, charac-

terised in that a baffle plate(33) is provided at each end of the heating assembly(40), wherein each baffle plate(33) has a slot(34) therein of width substantially equal to the predetermined width, and an opening(35) aligned with the bore(13). 5

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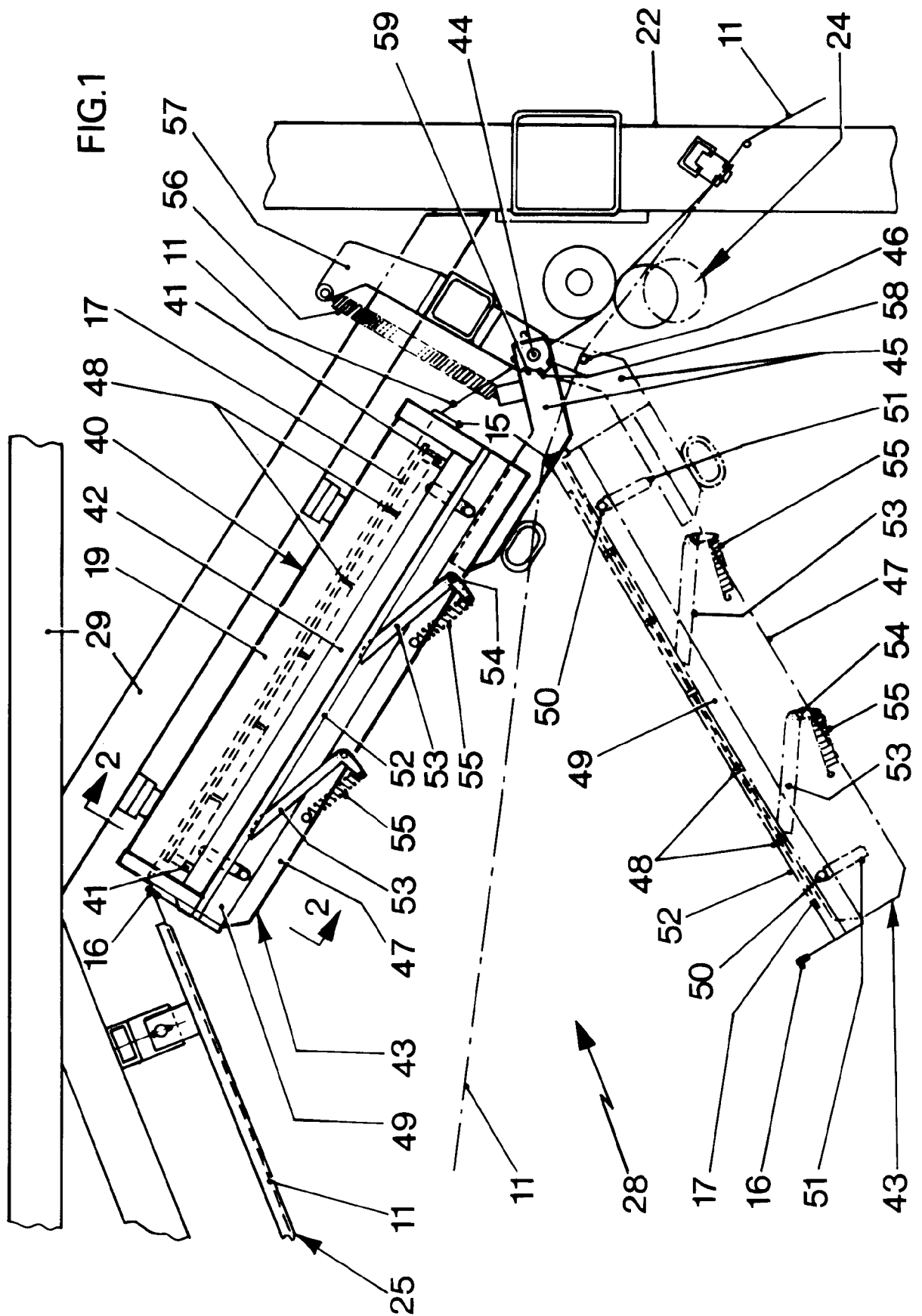
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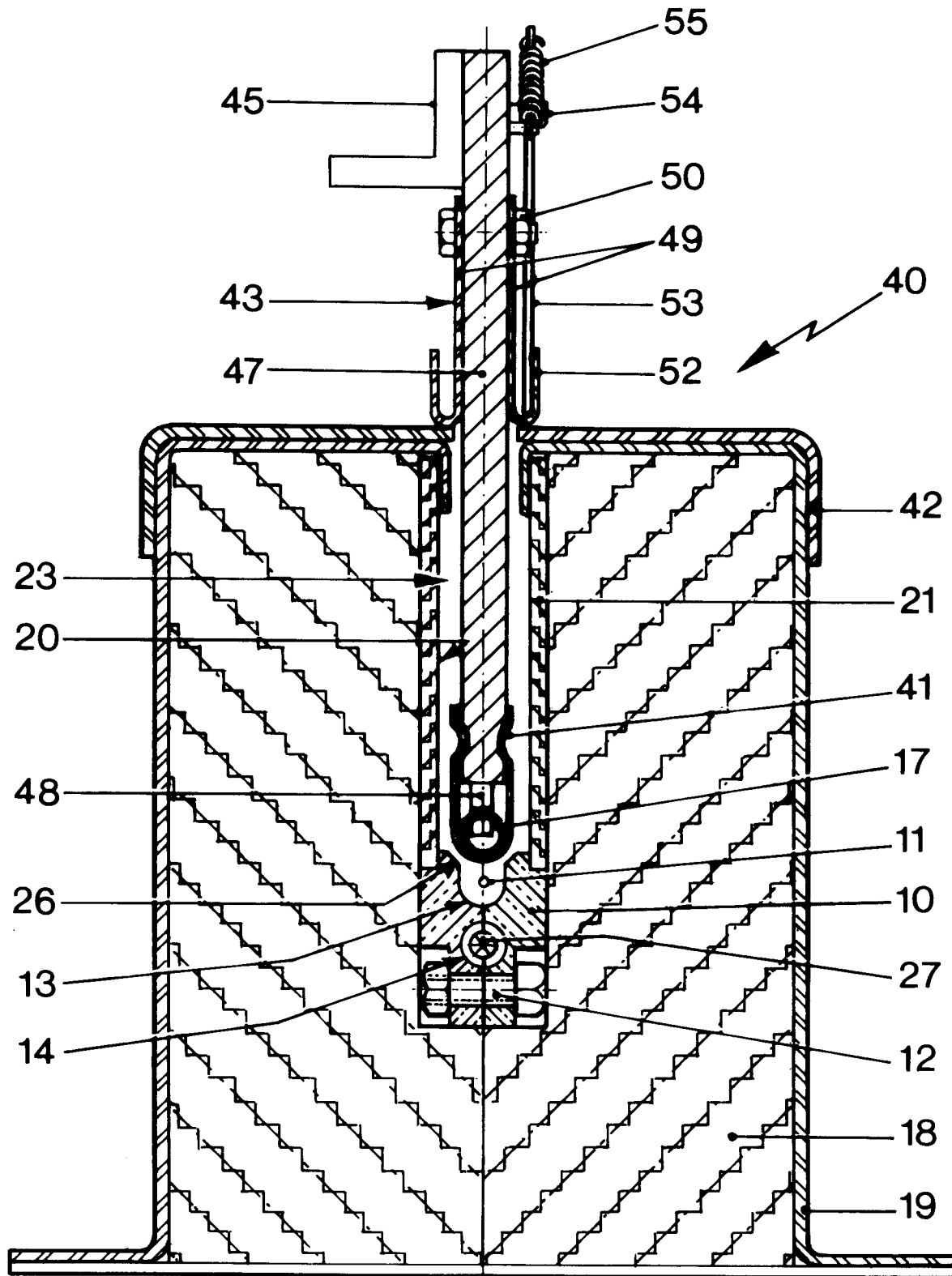


FIG. 2

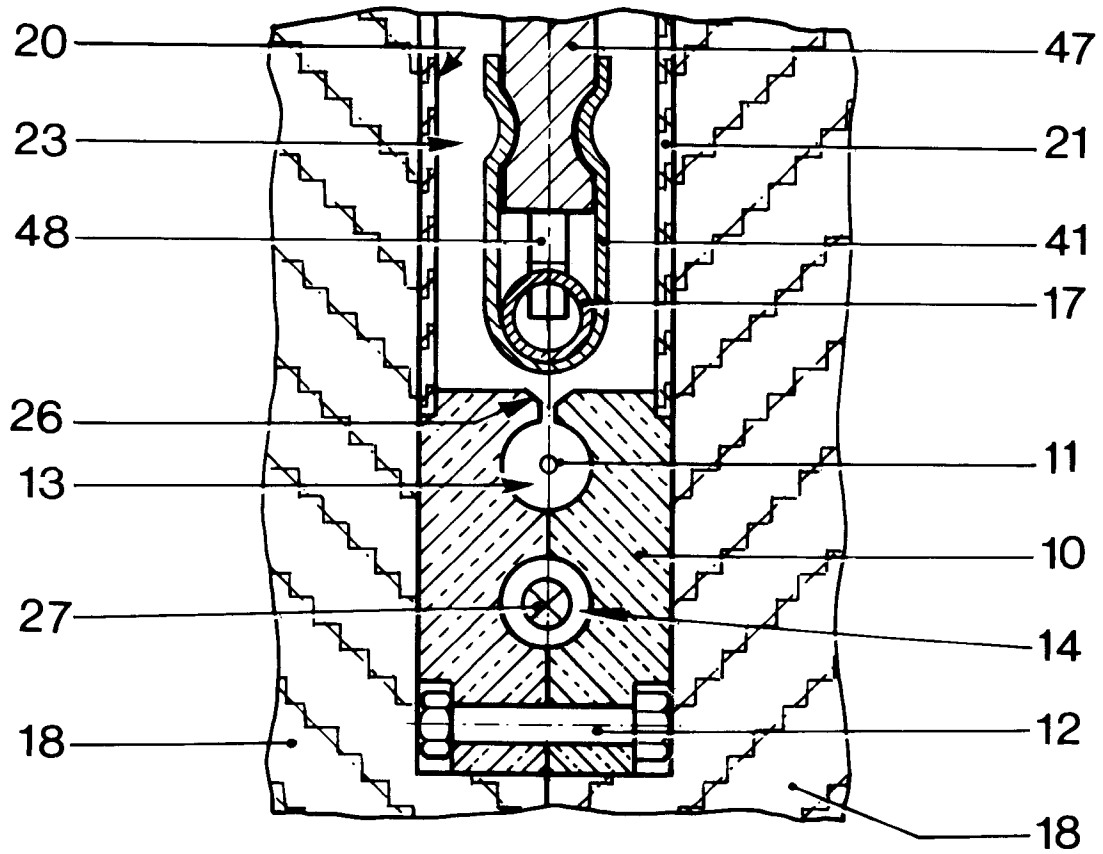


FIG. 3

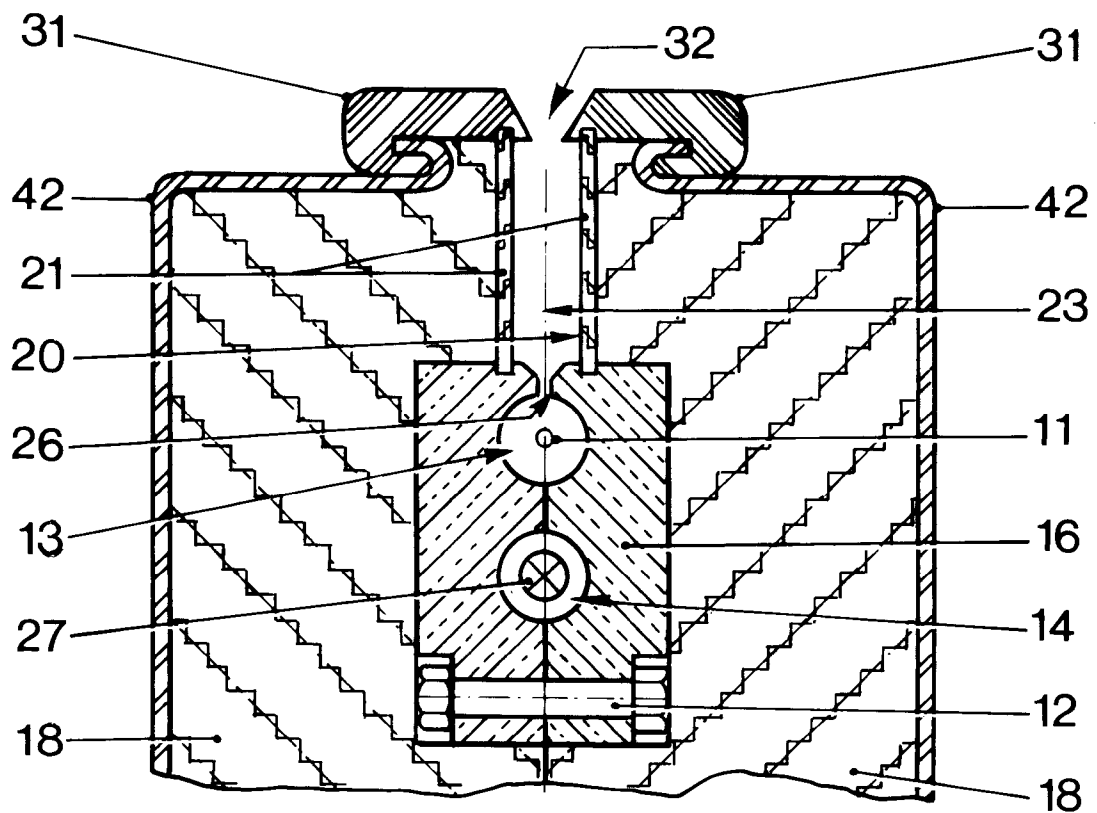


FIG. 4

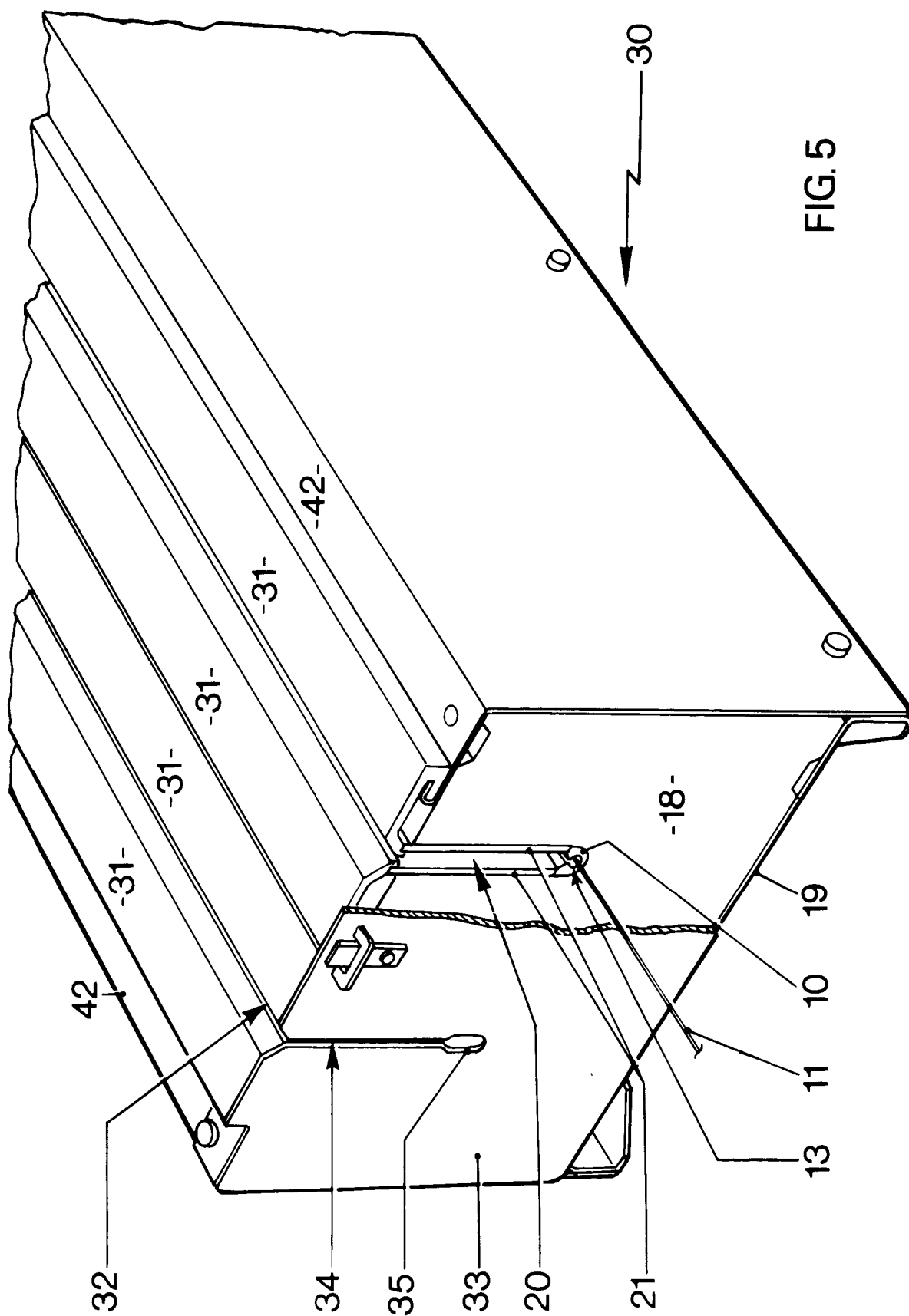


FIG. 5

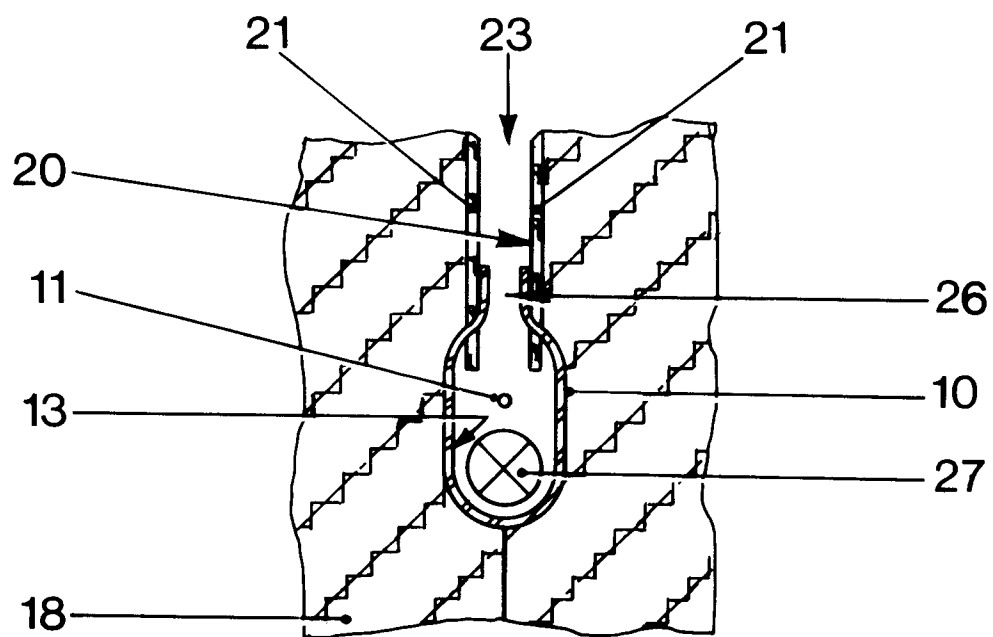


FIG. 6

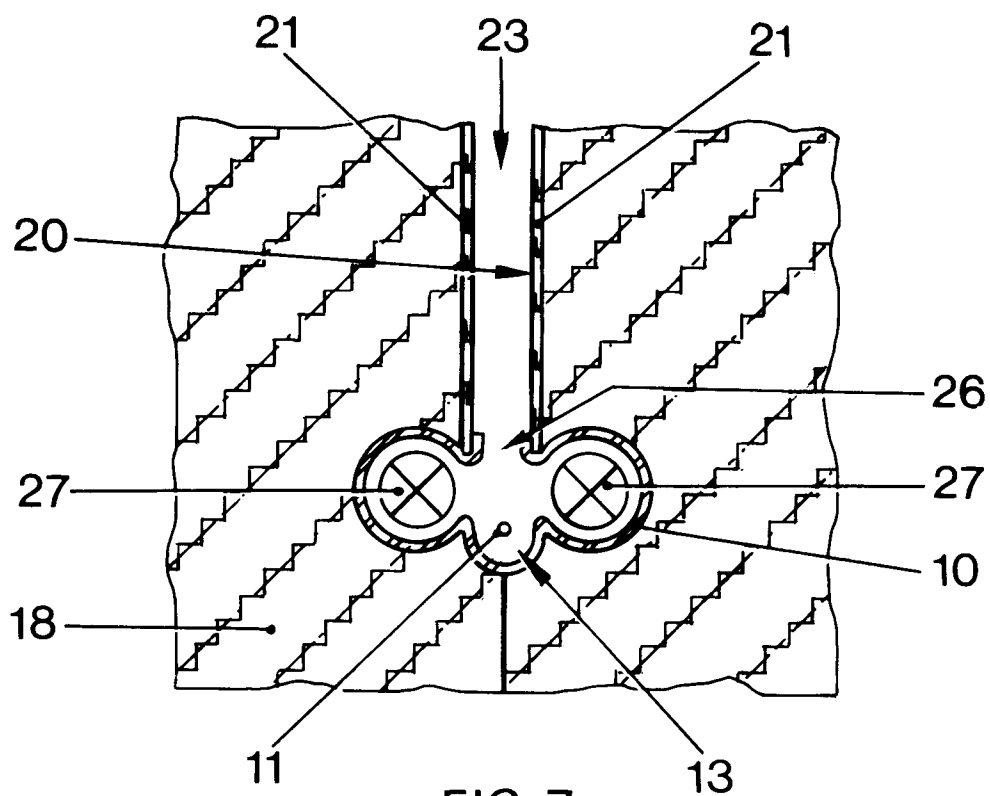


FIG. 7



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 30 0085

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X A	US-A-3 015 872 (JONES) * whole document *	1,2,6-8 3,9	D02J13/00
P,A	EP-A-0 483 989 (RIETER-SCRAGG LTD.) * whole document *	1,3,4	
A	US-A-2 204 603 (KLINE ET AL.) * whole document *	1,2	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D02J
Place of search THE HAGUE		Date of completion of the search 25 MARCH 1993	Examiner VAN BEURDEN-HOPKINS
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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