March 3, 1970 H. SCHIPPERS 3,498,230

SPINNING APPARATUS FOR MULTICOMPONENT THREADS

Filed April 14, 1966 2 Sheets-Sheet 1

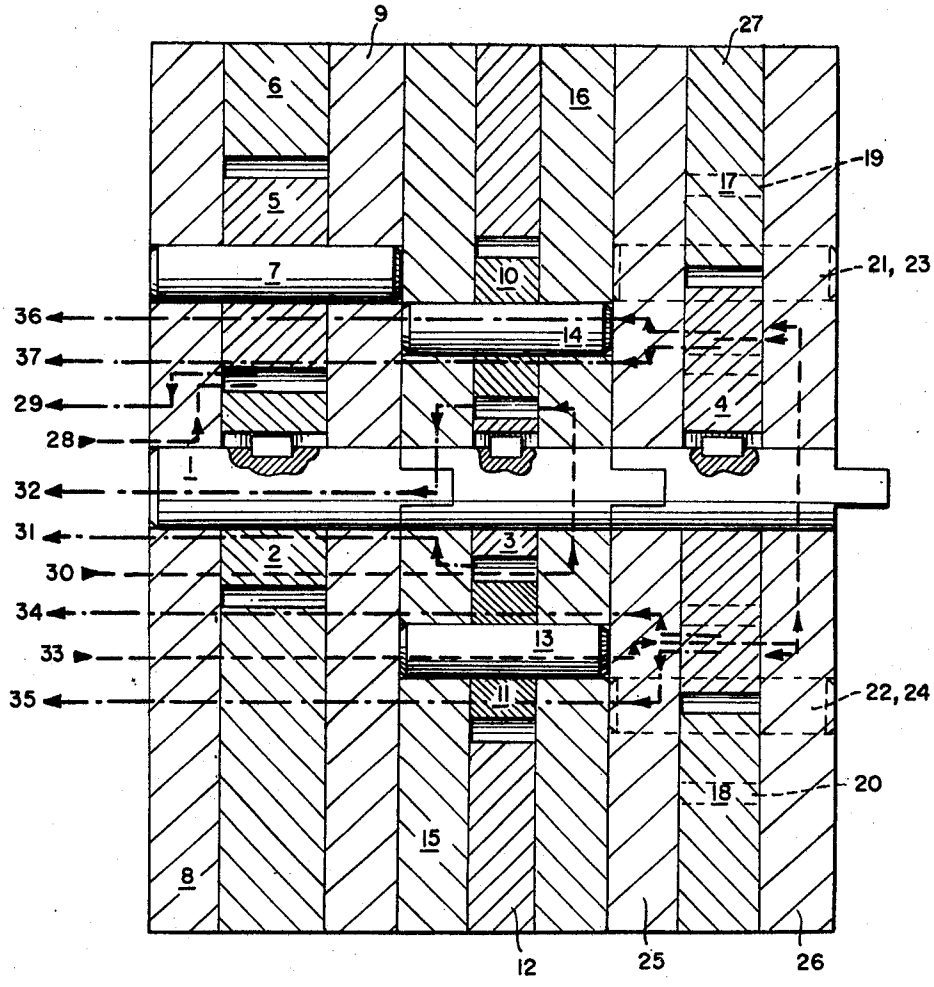



FIG. 1


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Filed April 14, 1966 2 Sheets-Sheet 2

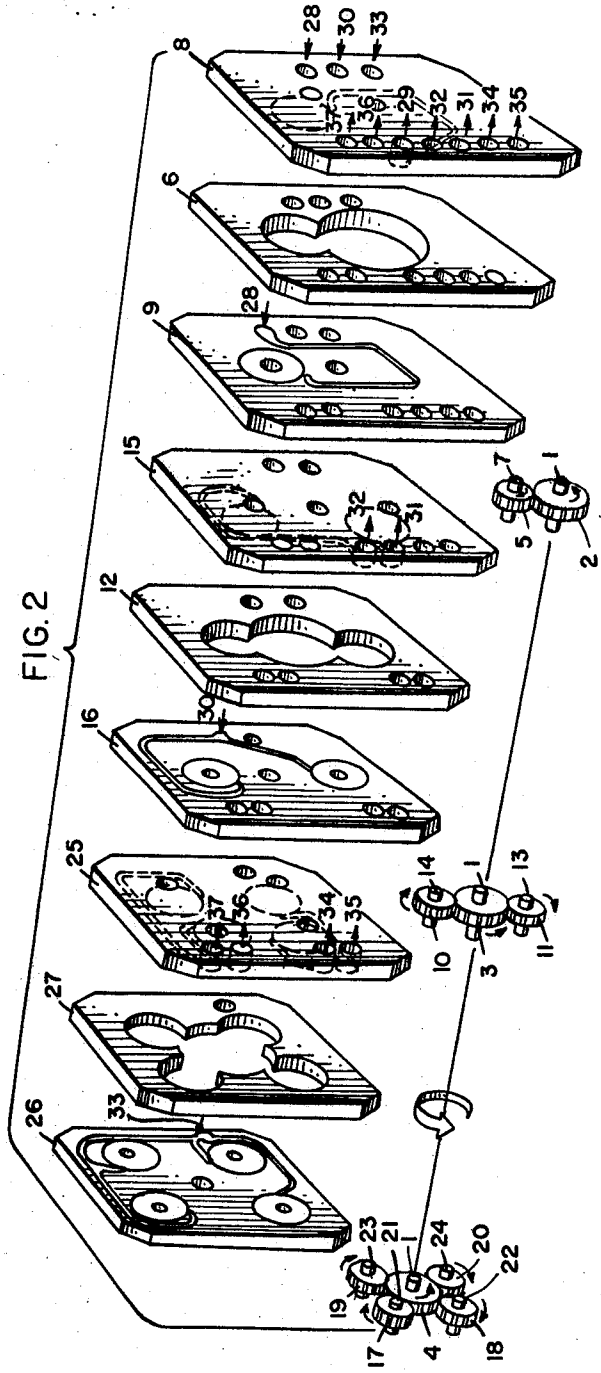


FIG. 2

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3,498,230

# SPINNING APPARATUS FOR MULTICOMPONENT THREADS

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Int. Cl. F04c 1/04
U.S. Cl. 103—126 5 Claims

## ABSTRACT OF THE DISCLOSURE

Apparatus for producing multicomponent threads, said apparatus including gear wheel pumps arranged axially on a common drive shaft and separated by intermediate plates, said gear wheel pumps including one or more paired gears for dividing and conveying a molten stream of filament forming material. The construction of the multiple pump is compact and makes it possible to supply to a spinning nozzle individual streams of melt which are combined either immediately prior to, within, or after passing through the nozzle to form an individual thread.

This invention relates to apparatus for spinning multicomponent threads, in which the various components are united before, in or directly after the spinning nozzle.

Both monofilament thread structures and also thread structures consisting of polyfilaments can be composed of individual threads of different spinnable material and be fused together exclusively at their points of contact. The production of such multicomponent threads is possible according to various processes. Thus, for example, it is a known practice to spin such multicomponent threads from a single nozzle by having the various melt flows meet directly before or in the nozzle opening. In another process one or more smaller nozzles are arranged in the spinning aperture of a larger nozzle in such a manner that the melt stream which is supplied directly to the latter surrounds the melt stream emerging from the smaller nozzles, so that a thread structure results consisting of core and envelope. Moreover, it is a known practice to gather threads of different materials immediately after their emergence from adjacently arranged nozzles into one thread, as long as the individual component threads are still in the plastic state and can be welded at their places of contact. Several combinations of materials used in producing multiple component threads are known. As an example, one well known component pairing consists of polyamide 6 and polyester.

In the aforementioned spinning processes it has hitherto been usual to convey each individual one of several components or also each single thread of several melt threads of a component to the nozzle by means of its own dosing pump. Since these pumps are generally arranged adjacent to each other forming a row, the space requirement for them is considerable. The resultant crowded condition is still further intensified by the fact that to each pump there are attached a feed line and a lead-off line for the melt stream to be conveyed. On the other hand, in order to save space, a multiple pump has been proposed with gear wheel pairings lying in one plane and centrally arranged common drive wheel and also double and quadruple gear wheel spinning pumps to which one or two melt streams are supplied, which then are subdivided by the pump into twice the number of emerging streams.

None of these known gear wheel pumps, however, is suitable for the spinning of multicomponent threads, since the entering melt streams are mixed with one another in passing through the pumps.



The present invention, therefore, has as its underlying object the devlopment of apparatus with the aid of which multicomponent threads can be spun all of whose components, possibly to be subdivided into several melt threads, are supplied to a single pump unit in common and from this, in each case unmixed, are supplied to the corresponding nozzles to be run together before, in, or after this into one thread. The special construction of this multiple pump unit is a further embodiment of the invention.

According to the invention it is proposed, therefore, that at least two different components be supplied as melt streams to a multiple gear wheel pump, of which each melt stream feeds, in each case, a pump set lying in one plane which is to have as many gear wheel pairings as the individual component is to have partial streams, and in which the conveyed partial streams of each component are led off individually. This process has the advantage that all the components including individual thread components which are involved in the formation of the multicomponent thread flow from a common unit in each case unmixed to the spinning nozzle. This makes possible as straight as possible conduction paths and, therefore, as short as possible staying times whereby the most favorable spinning conditions are assured. Moreover, the possibility of monitoring the whole installation of a spinning unit is considerably improved. The versatility of the process is made clear from the fact that the most diverse components can be involved in any desired differing melt amount or strength in the total thread, which is achieved through the feature that the amounts conveyed by the various pump sets can differ. Likewise, too, the melt threads of one and the same component may be of differing thickness among one another. This effect is achieved through the feature that the amounts conveyed by the gear wheel pairings of a pump set can differ.

For carrying out the process there is proposed a multiple gear wheel pump in which several pump sets which, in each case, consists of at least one and preferably two or more gear wheel pairings lying in one plane, are arranged axially one behind the other, and which is designed in such a way that each pump set has a feed channel of its own and between adjacent pump sets there are arranged for their separation in each case two intermediate plates, which take up the feed or lead-off system of two adjacent pump sets as well as of the gear wheel pairings lying in one plane. The arrangement of several pump sets in succession (one behind the other) makes possible, with the greatest possible saving of space, the separate conveyance of an arbitrary number of different thread components, since each pump set is fed by a feed line of its own. Frequently it is desired to subdivide an individual component into several threads. For such cases multiple pumps lying in one plane can be used as a pump set. For a thread component which, say, is to be divided into four similar melt threads there is chosen a pump set in which four gear wheels are driven by a central disposed gear wheel in common, in which system each of the four wheels forms with the drive wheel a gear wheel pairing by itself and thereby a conveyance unit or pump. Through arranging of several pump sets of differing pump number one behind the other it is possible to produce both monofilaments composed of several different type individual threads and also multifiles composed of several components, possibly composite. Further, the individual thread components may also be desired in unequal proportions in the total thread. For this reason it is proposed that the tooth width of the gear wheels of one pump set be made different from that of the gear wheel or gear wheels of the other pump set or sets. The described arrangement of several pump sets yields a very compact structural unit, whose heat losses can be kept very low in contrast to the

known spinning systems with a large number of individual pumps.

Furthermore, the proposed structural unit permits a drive in common for all the pumps arranged in it, since the drive wheels of all the pump sets are seated on a common drive shaft. This measure offers the advantage of making the individual spinning unit and thereby the whole machine installation still more compact. The common drive also has a good effect on the process, for with multicomponent threads there exists in general the requirement that the desired proportional relationship of the individual components in the total thread remain constant over the whole spinning time. Through possible fluctuations in turning speed, such as otherwise occur in the drive of one or the other pumps involved in the thread formation and driven by themselves, the maintenance of the required proportional relationship is placed in doubt. In the proposed common drive, however, such fluctuations that occur have the same effect on all the pumps participating, so that the constant quantitative ratio of the components among one another remains assured. In order to facilitate the changing of a pump, it is proposed that the whole length of the drive shaft be divided one or more times. There the driven gear wheels of the pump sets can in each case be arranged loosely turnable on their shafts, which, assured in a usual manner against turning, are seated in the appertaining intermediate plates. Likewise, the driven gear wheels of the pump sets may, however, also be fixedly seated on their shafts which then, on their part, are rotatably mounted in the appertaining intermediate plates.

FIG. 1 is a schematic representation in section through the axis of rotation of the common drive shaft of a pump unit consisting of three pump sets; and

FIG. 2 is an exploded diagrammatic view of the pump unit.

For the sake of better understanding, the representation of the screw connection of the pump sets as well as of the feed and run-off passages has been dispensed with. Instead, the melt influxes are shown in broken lines and melt effluxes by dot-and-dash lines in simplified form and the flow direction is indicated by arrows.

On the common drive shaft **1**, which is divided into three sections, there are mounted, keyed by means of fitting springs, drive wheels **2**, **3** and **4** of the three pump sets included in known manner to form a unit. The drive wheel **2** forms with the gear wheel **5** likewise visible in the section drawing, a pump set consisting of only one pump, which is received by casing plate **6**. Wheel **5** turns on shaft **7**, which is fixedly mounted in front plate **8** and intermediate plate **9**. Gear pump **3** keyed on drive shaft **1** drives the two other gear wheels **10** and **11** of the second pump set, which consists of two pumps and is enclosed by casing plate **12**. Shafts **13** and **14** on which the two wheels **10** and **11** turn are seated solidly in intermediate plates **15** and **16**. Drive wheel **4** drives four further gear wheels **17**, **18**, **19** and **20**, of which wheels **17** and **18** lie behind the section plane and wheels **19** and **20** in front of the section plane. Shafts **21**, **22**, **23** and **24** are solidly seated in intermediate plate **25** and back plate **26**. All the wheels of this third pump set are received by casing plate **27**, gear wheel **17** being borne on shaft **21**, wheel **18** on shaft **22**, wheel **19** on shaft **23** and gear wheel **20** on shaft **24**.

The pump set lying in the plane of casing plate **6** consists of only one pump, which is formed by gear wheels **2** and **5**. In usual manner feed and off-flow lines lead to the suction and pressure sides, respectively, of this gear wheel pairing. The inflow is indicated by the broken line **28** and the off-flow by the dot-and-dash line **29**. The gear wheel pairs of the second pump set are formed, in the first place, of gear wheels **3**, **10** and, in the second place, by wheels **3**, **11**. A sole feed line **30** is provided for this pump set. After a part of the melt stream conducted in this is taken up by the wheel pairing **3**, **11**, which is then conveyed onward through the efflux line **31**, the other part flows through a connecting passage in the intermediate plate **16** and/or **25** to the second wheel pair **3**, **10** of this pump set, which leads the spinning melt over the efflux line **32** of the nozzles. In a similar manner the passage system is laid out for the third pump set accommodated in the casing plate **27**. Each of the four driven gear wheels **17**, **18**, **19** and **20** forms together with the gear wheel **4** a gear wheel pair and thereby a conveyance unit. The afflux line indicated by broken line **33** leads to the sole melt stream which feeds the aforementioned four gear wheel pairs. After supplying one of the four conveyance units the melt afflux is divided into three partial flows, flow in separate feed passages in the back plate **26** or in an intermediate plate possibly additionally arranged, but not represented in the drawing, between plates **26** and **27** to the other gear wheel pairs of this pump set. Four separate efflux channels **34**, **35**, **36** and **37** lead from the conveyance points **4**, **17**; **4**, **18**; **4**, **19**; and **4**, **20** out of the pump structure to the outside.

The grouping of three pump sets represented in the drawing is to be regarded only as an example. It would be possible, for example, for a greater or lesser number of pump sets to be arranged one behind the other or the number of pumps of which these pump sets consist can be carried at will. There can also be arranged several pump sets of equal pump number axially in succession, in which case each pump set is fed only by one melt stream. In order in the changing of pump sets to keep the length dimension of the pump block unit equal for the installation in the connections present, it is proposed that the sum of the plate thickness of the front, casing, intermediate or back plates be altogether equal regardless of the particular tooth width of the pump set gear wheels. In changing of gear wheels of different gear width within the pump set, for example, there can be allocated to the gear wheel of smaller tooth width an undentated blind disc (plate) of compensating height. In order to avoid the possibility of the mixing of two components in consequence of their possible tendency to creep on the shafts, the pump sets can be offset (staggered) with respect to one another in such a way that the shafts of the driven gear wheels are not aligned with one another. Finally, the drive shaft or its sections can be packed at the separation points of the pump sets by means of known packing elements against any possible melt creeping tendency.

Obviously many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

**1.** A multiple gear wheel pump unit for conveying and dividing streams of individual components of multi-component threads which comprises: a common drive shaft axially mounted within said pump unit; a plurality of axially arranged gear wheel pumps, each of said pumps being mounted within a gear wheel casing plate and having front and back paired cover plates, said pumps including a drive gear wheel driven by said common drive shaft and an additional pump gear wheel for each stream to be generated by said gear wheel pump; ingress passage means within said pump unit for conducting said streams of individual components to said gear wheel pumps; branch passage means within one of said paired cover plates to distribute said component to each of said pump gear wheels; passage means in each of said other paired cover plates for conducting melt away from each of said pump gear wheels; and discharge passage means within said pump unit for conveying said divided streams out of said unit, the exit openings for said discharge passage means and the ingress openings for said ingress passage means being located at the same end of said pump unit.

2. A multiple gear wheel pump as in claim 1 wherein the tooth width of the gear wheels of one pump set differs from the tooth width of the gear wheels of another pump set.

3. A multiple gear wheel pump as in claim 1 wherein the total length of the drive shaft is divided one or more times.

4. A multiple gear wheel pump as in claim 1 wherein the driven gears of the pump units are each rotatably mounted on respective shafts which in turn are seated in contiguous cover plates.

5. A multiple gear wheel pump as in claim 1 wherein the driven gears of the pump units are fixedly seated on respective shafts which in turn are rotatably mounted in contiguous cover plates.


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(5/69)

# UNITED STATES PATENT OFFICE
# CERTIFICATE OF CORRECTION

Patent No. 3,498,230 Dated March 3, 1970

Inventor(s) Heinz Schippers

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 5, after "Germany" insert -- , assignor to Barmer Maschinenfabrik Aktiengesellschaft, Wuppertal-Oberbarmen, Germany --.

Column 2, line 57, "central" should read -- centrally --.

Column 4, line 6, "of" should read -- to --.

SIGNED AND
SEALED
NOV 17 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents