

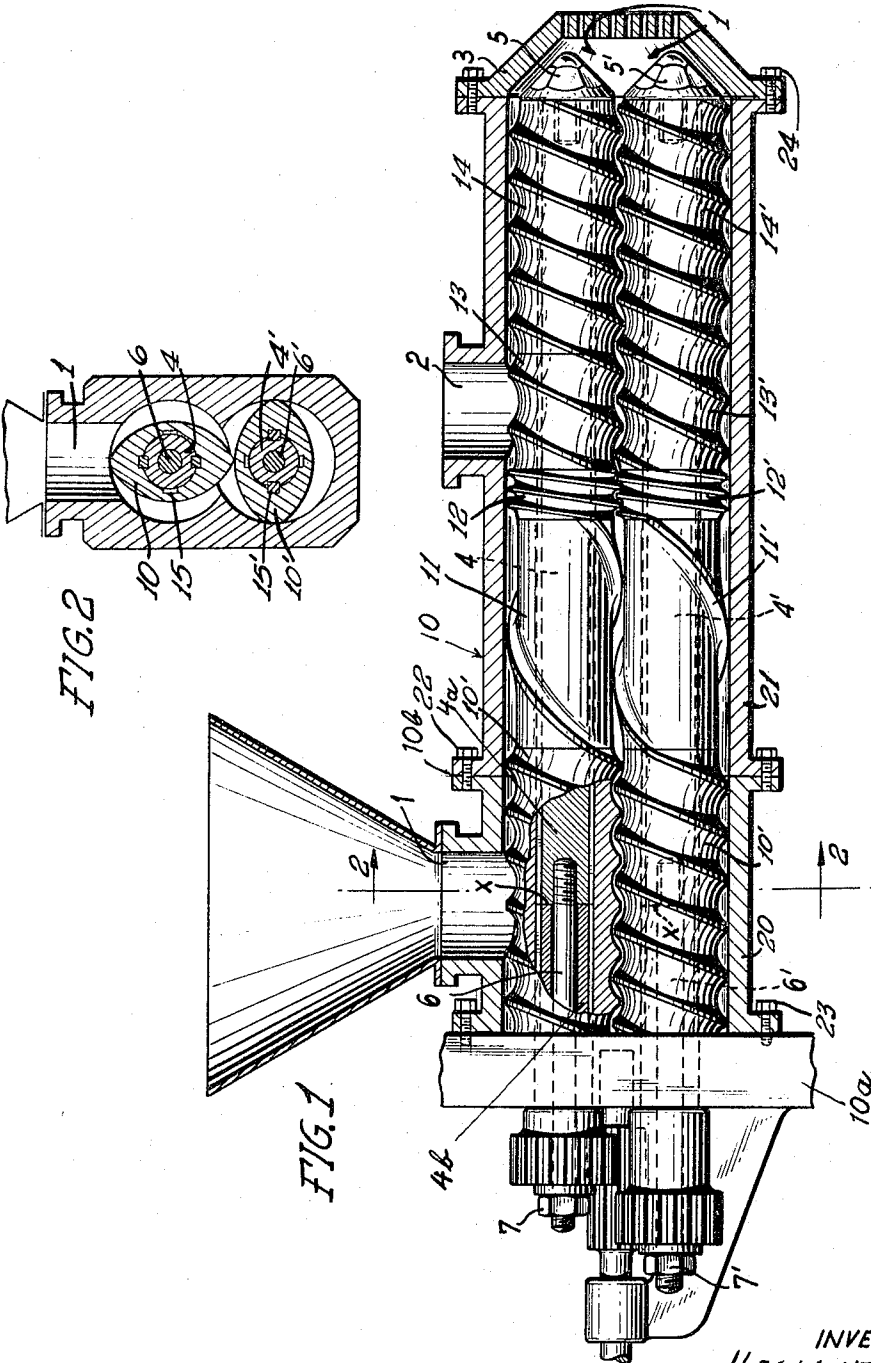
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TREATMENT DEVICE FOR PLIABLE MASSES

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TREATMENT DEVICE FOR PLIABLE MASSES

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The present invention relates to a device including a rotary worm shaft or several coating parallel worm shafts for continuously feeding, mixing, kneading, degassing and extruding or otherwise treating materials in a pliable state, particularly thermoplastic synthetic plastics such as polyamid or polyolefine and more particularly to devices of the general kind above referred to in which different worm sections each designed for a specific treatment operation, are lengthwise slidably mounted upon a common drive shaft secured against rotation in reference to the shaft.

Devices of the general kind above referred to may be adapted for different specific treatments of different masses by exchanging selected ones of the worm sections of the device by other worm sections which may have, for instance, another pitch to vary the feeding capacity of the respective worm section, the kneading or mixing action, etc., of the device as required. Exchange of selected worm sections is effected by pulling off the worm section or sections to be exchanged from one end of the common drive shaft and then reassembling the sections after exchanging one or several sections.

The aforeindicated adjustability of the treatment devices as heretofore known for a wide range of operational conditions is counterbalanced by the disadvantage that, to exchange one of the worm sections, all the sections between the section to be exchanged and the respective end of the shaft must be disassembled and reassembled. When, for instance, the charging or feeding worm section which is usually disposed below the feed port or hopper of the device is to be exchanged, all other sections must be removed before the feed section can be withdrawn. As it is evident, such extensive disassembly and reassembly to exchange one section is time consuming and hence expensive.

It is a broad object of the present invention to provide a novel and improved treatment device of the general kind above referred to which permits an exchange of a selected one of the worm sections, in particular of the feeding section, in a greatly simplified manner.

A more specific object of the invention is to provide a novel and improved device of the general kind above referred to, the feeding section or any other selected worm section of which can be exchanged without requiring a disassembly and reassembly of all the other worm sections of the device.

Another more specific object of the invention is to provide a novel and improved treatment device of the general kind above referred to which is so arranged that when one of the worm sections such as the feeding section is to be exchanged, all or at least several of the other worm sections may be withdrawn as a unit together with a common drive shaft section and also reinstalled as a unit.

The aforementioned objects, features and advantages of the invention and other objects, features and advantages of the invention which will be pointed out hereinafter are attained by dividing the common drive shaft into at least two shaft sections, for instance into a short section supporting the feeding worm section and a long shaft section supporting the other worm sections, and by

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providing fastening means between the two shaft sections which can be loosened or tightened from the outside of the device.

In the accompanying drawing a preferred embodiment of the invention is shown by way of illustration and not by way of limitation.

The exemplified device comprises two worm shafts disposed parallel to each other in coating relationship in a housing 10. Each worm shaft includes worm sections 10, 11, 12, 13, 14 and 10', 11', 12', 13', 14' seated on a common drive shaft 4 and 4' respectively. The worm sections are lengthwise slidable on the shafts but secured against rotation in reference to the shafts, for instance by suitable and conventional key means 15 and 15'.

Worm sections 10 and 10' constitute the feeding section of the device disposed below a feed port or hopper 1; worm sections 11 and 11' constitute a mixing and kneading section which also has a plasticizing action; and worm sections 12 and 12' shown as having a much lower pitch than the mixing and kneading section retard the passage of the mass through the housing to obtain the required dwell time of the mass within the operational range of worm section b. Worm sections 13 and 13' which have a steeper pitch than worm sections 12 and 12' convey the mass from the worm sections 12 and 12' to the extruding worm sections 14 and 14' at a very low pressure. A degassing port 2 communicates with worm sections 13 and 13' to remove any gases occluded in the mass. The treated mass is pressed out through a discharge nozzle cap can 3 of suitable design. All the worm sections are axially locked on the drive shaft 4 and 4' respectively by any suitable means such as hexagonally headed screws 5 and 5' respectively screwed into the respective end face of the shafts.

To exchange the feeding worm sections 10 and 10' without individually removing all the other worm sections from the respective shaft, both shafts are divided in two shaft sections at the partition line x thus providing a long shaft section 4a and a short shaft section 4b. The short shaft section seats worm sections 10 and 10' while all the other worm sections are seated on the long shaft section. The two shaft sections are releasably secured to each other by suitable fastening means shown as a screw bolt 6 in the short shaft section screwable into a threaded bore in the adjacent end face of the long shaft section. Screw bolt 6 extends through the outside wall 10a of housing 10 and is locked in position by nuts 7 and 7' respectively, or by any other suitable locking means. As it is evident, the screw bolts and the nuts when tightened will secure all the worm sections in the correct axial positions. The housing is composed of sections 20 and 21 secured to each other by conventional fastening means such as screws 22. Housing section 20 is secured to wall 10a by conventional fastening means such as screws 23 and housing section 21 to nozzle cap 3 by conventional fastening means such as screws 24.

To effect an exchange of worm sections 10 and 10', the fastening means between the two shaft sections 4a and 4b of each worm shaft are released as previously described. After removal of nozzle 3 by loosening of screws 24, the long shaft sections 4a and the worm sections 11, 11'; 12, 12'; 13, 13'; and 14, 14' seated thereon can now be withdrawn from the short shaft sections 4b as a unit and also reinstalled as a unit after an exchange of sections 10, 10' by other worm sections which, for instance, may have a different pitch to change the feeding capacity of the feed section. Withdrawal of the long shaft sections can also be effected after dismantling the housing at flanges 10b by loosening screws 22.

As is readily apparent, the concept of the invention is not limited to a division of the drive shafts within the

range of feed section *a* but the drive shafts may also be divided within the range of any other worm sections and into more than two sections.

While the invention has been described in detail with respect to a certain now preferred example and embodiment of the invention, it will be understood by those skilled in the art, after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore to cover all such changes and modifications in the appended claims.

What is claimed as new and desired to be secured by Letters Patent is:

We claim:

1. A device for continuously feeding and treating a mass in a pliable state by subjecting the mass successively to different treatment operations, said device comprising a rotary worm shaft, said worm shaft including a rotary drive shaft divided into at least two shaft sections, and a plurality of worm sections, at least one worm section being fully seated on one of said shaft sections axially freely slidable thereon but secured against rotation in reference thereto and several worm sections being seated on the other shaft section axially slidable thereon but secured against rotation in reference thereto, and fastening means between the adjacent ends of the shaft sections operable from the outside of said device for releasably securing the two shaft sections to each other and the worm sections thereon in fixed axial positions in reference to each other and the shaft sections whereby the two shaft sections and the worm sections seated thereon are separable by sliding the worm sections along the shaft sections upon releasing said fastening means for the purpose of replacing said one worm section seated on said one shaft section.

2. A device according to claim 1 wherein said fastening means comprise an engaging fastening element on one of said shaft sections and a receiving fastening element on the other shaft section, said engaging fastening element protruding from the outer end of the respective shaft section for tightening and loosening the engaging fastening element in the receiving fastening element from the outside of the device.

3. A device according to claim 1 wherein said fastening means comprise a screw bolt lengthwise extending through one shaft section from the outer end thereof and screwable into a threaded bore in the end face of the other shaft section, and means on the outside of the device for tightening and loosening said screw bolt.

4. A device for continuously feeding and treating a mass in a pliable state by subjecting the mass successively to different treatment operations, said device comprising a rotary worm shaft, said worm shaft including a rotary drive shaft divided into a short shaft section and a longer shaft section, a worm section seated on the short shaft section axially slidable but secured against rotation in reference thereto, several worm sections seated on the longer shaft section axially slidable but secured against rotation in reference thereto, and fastening means between the adjacent ends of the shaft sections operable from the outside of the device for releasably securing the two shaft sections to each other and the worm sections thereon in fixed axial positions whereby the longer shaft section with the several worm sections supported thereon is separable from the short shaft section as a unit upon releasing said fastening means for exchanging said worm section seated on said short shaft section.

5. A device according to claim 4 wherein said fastening means comprise an engaging fastening member on said short shaft section and a receiving fastening member on said longer shaft section, said engaging fastening member protruding from the outer end of the short shaft section for tightening and loosening the engaging fastening member in the receiving fastening member.

6. A device according to claim 4 wherein said fastening means comprises a screw bolt lengthwise extending through the short shaft section from the outer end thereof and screwable into a threaded bore in the adjacent end face of the longer shaft section, and means on the outside of the device for tightening and loosening said screw bolt.

7. A device according to claim 4 wherein said worm section seated on the short shaft section is a feeding worm section, and the several worm sections on the longer shaft section are worm sections different one from another for subjecting the mass to be treated to different treatment operations.

8. A device for continuously feeding and treating a mass in a pliable state by subjecting the mass successively to different treatment operations, said device comprising several coaxing parallel worm shafts, each of said worm shafts including a rotary drive divided into a short shaft section and a longer shaft section, one worm section seated on each of the two short shaft sections, axially slidable but secured against rotation in reference to the respective short shaft section, several worm sections seated on each of the longer shaft sections axially slidable but secured against rotation in reference to the respective longer shaft sections, and a fastening means between the adjacent ends of the shaft sections operable from the outside of the device for releasably securing the two shaft sections of each worm shaft to each other and the respective worm sections in fixed axial positions in reference to each other, whereby each longer shaft section with the several worm sections supported thereon is separable from the respective short shaft section as a unit upon releasing the respective fastening means for exchanging the worm sections seated on said short shaft sections.

9. A device according to claim 8 wherein said one worm section on each short shaft section is a feeding worm section, and a feed hopper for feeding a supply of the mass to be treated is disposed above said feeding worm sections in communication therewith.

10. A device according to claim 8 and comprising a housing, said worm shafts being rotatably supported in said housing, and said fastening means protruding from one side of the housing for operation of the fastening means.

11. A device according to claim 10 wherein each of said fastening means comprises an engaging fastening member on the respective short shaft section and a receiving fastening member on the respective longer shaft section, each of said engaging fastening members protruding from the outer end of the respective short shaft section and the housing for tightening and loosening the engaging fastening member in the respective receiving fastening member.

12. A device according to claim 8 wherein each of said fastening means comprises a screw bolt lengthwise extending through the respective short shaft section from the outer end thereof and screwable into a threaded bore in the adjacent end face of the respective longer shaft section, and means on the outside of the device for tightening and loosening said screw bolts.

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