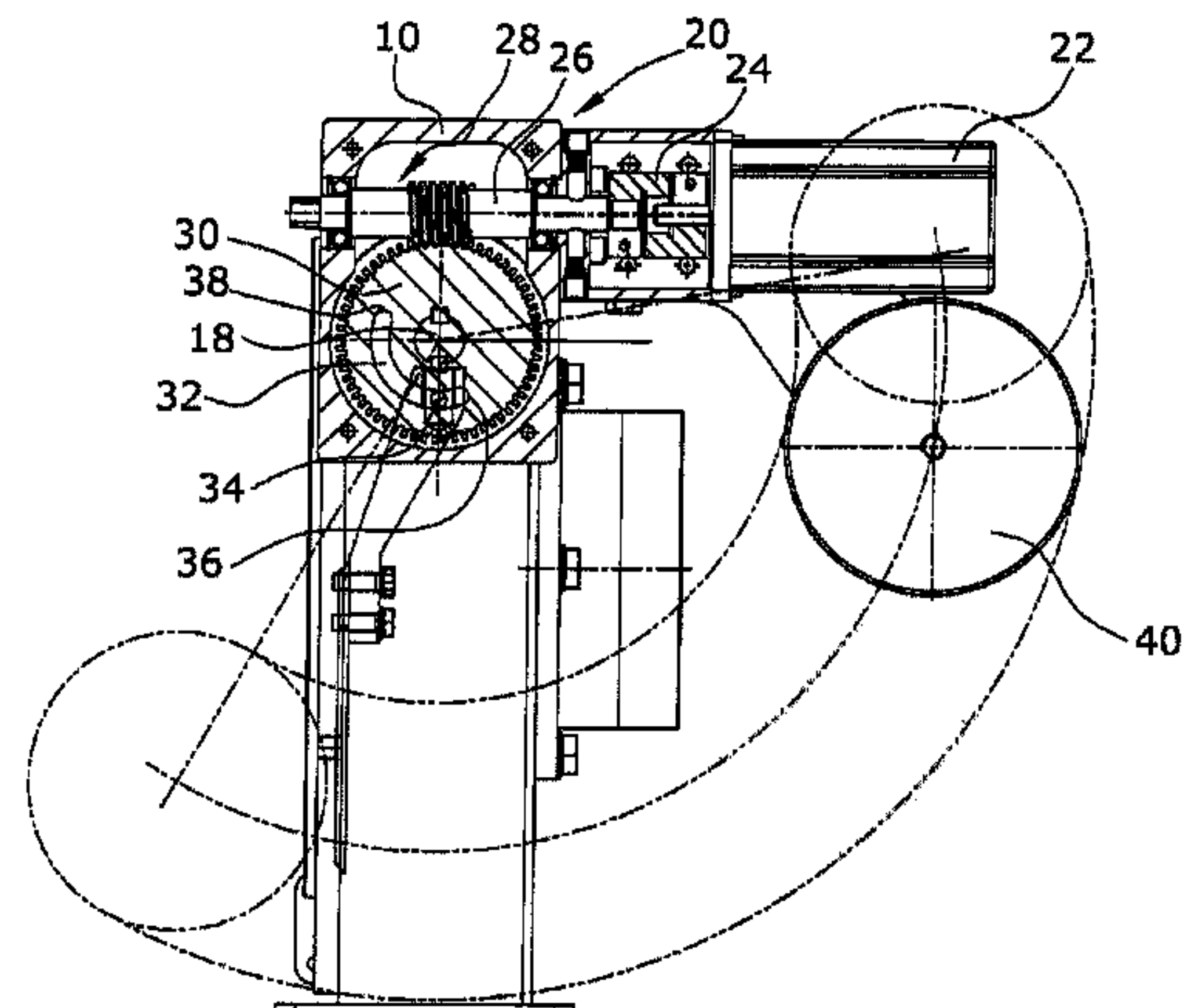
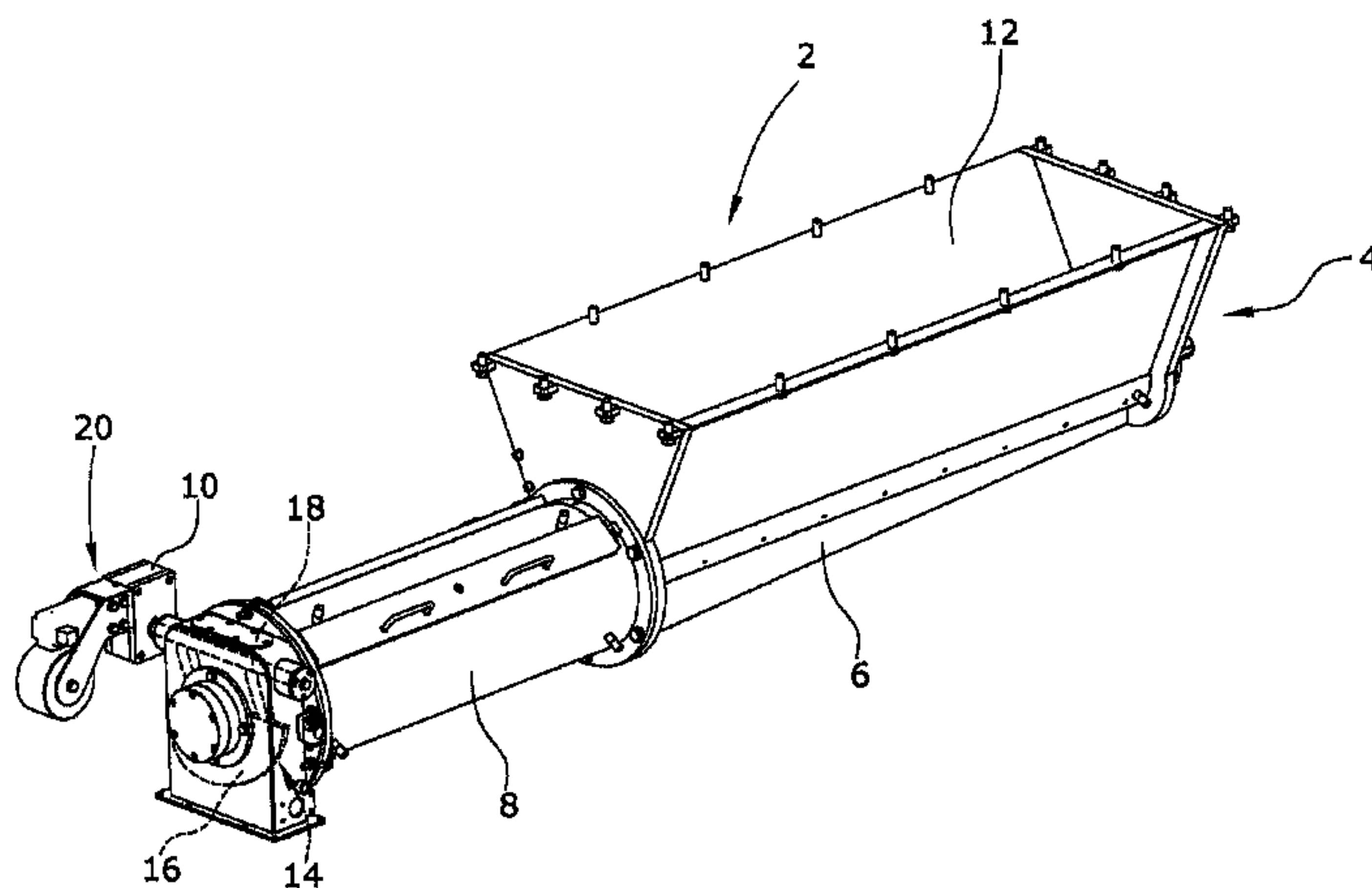




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(54) **Titre : SYSTEME DE COMPRESSION POUR COMPRIMER AUTOMATIQUEMENT DU CAFE MOULU**
(54) **Title: COMPRESSOR ARRANGEMENT FOR AUTOMATIC COMPRESSING OF GROUND COFFEE**



(57) **Abrégé/Abstract:**

A compressor arrangement for automatically compressing ground coffee includes a housing having an inlet opening and an outlet opening with a retention flap which adjusts a bulk density of the ground coffee, conveying and compressing elements arranged in the housing which are driven by a first drive device, and an adjustment device which pre-adjusts the bulk density of the ground coffee. The adjustment device comprises a second drive device, a retention flap shaft, a retention flap arranged on the retention flap shaft, a transmission which is operatively connected to each of the second drive device and the retention flap shaft, and an automatic dynamic pressure adjustment apparatus which enlarges or reduce a preset of the opening angle dependent on a higher dynamic pressure or a lower dynamic pressure being exerted on the retention flap. A transmission housing part is provided which is supported on the retention flap shaft, wherein the transmission housing part has a defined weight assigned thereto that allows the preadjustment of the desired opening angle.

ABSTRACT

A compressor arrangement for automatically compressing ground coffee includes a housing having an inlet opening and an outlet opening with a retention flap which adjusts a bulk density of the ground coffee, conveying and compressing elements arranged in the housing which are driven by a first drive device, and an adjustment device which pre-adjusts the bulk density of the ground coffee. The adjustment device comprises a second drive device, a retention flap shaft, a retention flap arranged on the retention flap shaft, a transmission which is operatively connected to each of the second drive device and the retention flap shaft, and an automatic dynamic pressure adjustment apparatus which enlarges or reduce a preset of the opening angle dependent on a higher dynamic pressure or a lower dynamic pressure being exerted on the retention flap. A transmission housing part is provided which is supported on the retention flap shaft, wherein the transmission housing part has a defined weight assigned thereto that allows the preadjustment of the desired opening angle.

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Description

Compressor arrangement for automatic compressing of ground coffee

The invention relates to a compressor arrangement for automatic compressing of ground coffee having a first housing which has an inlet and outlet opening, wherein conveying and compressing elements are provided in the housing which are drivable by means of at least one first drive device, wherein the outlet opening has a retention flap which serves to adjust the bulk density of the ground coffee, wherein an adjustment device is provided via which a preadjustment of the bulk density can be adjusted.

Such compressor arrangements are well known from prior art. For example, DE 197 18 455 A1 describes a compressor arrangement wherein the ground coffee coming from a grinder is compressed according to specifications regarding filling weight and filling volume. To achieve this, the ground coffee to be filled must have a defined bulk density (gram per cm³). For this purpose, the compressor arrangement of DE 197 18 455 A1 has a retention flap at an outlet opening of the compressor arrangement, which can be adjusted with an opening angle from 0° to 90° depending on the desired bulk density. In the region of the outlet opening a measuring means for the bulk density or the degree of compaction is provided so that a regulation is possible via an adjustment of the retention flap.

The arrangement of the measuring device in the region of the outlet opening is complicated and is therefore costly and susceptible to failure. Further, sudden variations in the quantity of ground coffee in the compressor, which are caused e.g. by ground coffee slipping from side walls of the compressor trough, cannot be compensated which may lead to overload damage to the first drive means.

Thus, it is an object of the present invention to provide a compressor arrangement for automatic compression of ground coffee which avoids the above disadvantages in an economic and simple manner.

This object is achieved by the adjustment device comprising a second drive device operatively connected with a transmission which is operatively connected to a retention flap shaft on which the retention flap is arranged such that the transmission has means which enable a limiting of the opening angle of the retention flap, and wherein an automatic dynamic pressure adjustment apparatus is provided which, in the case of a higher or lower dynamic pressure being exerted on the retention flap, enables an enlarging or reducing of the preset opening angle. Thus, the retention flap is no longer preset to a defined angle but it may be pivoted up to a certain predefined opening angle. Due to the mechanical dynamic pressure adjustment apparatus, a short-term exceeding or undershooting of the ground coffee quantity, and thus an increase or decrease in the dynamic pressure acting on the retention flap, can thereby be compensated in a simple manner. The retention flap may thereafter be pivoted back to the preset opening angle. As a consequence, a measuring means in the region of the outlet opening is no longer required.

In an advantageous embodiment the transmission is a worm gear with a worm shaft and a worm wheel, wherein a transmission housing part is provided which is rotatably supported on the retention flap shaft and in which the worm shaft is supported on the retention flap shaft for rotation with the same, such that a rotation of the worm shaft allows a rotation of the transmission housing part around the worm wheel, and wherein the transmission housing part has a defined weight assigned thereto that allows the preadjustment of the desired opening angle. In this manner, on the one hand, a preadjustment of the maximum opening angle of the retention flap is made in a particularly simple manner, wherein the mechanical dynamic pressure adjustment apparatus is realized by the transmission and the transmission housing part with the associated weight, such that in case of a required adjustment of the preset opening angle, the retention flap shaft may pivot with the transmission housing part via the transmission. Due to the weight adjustment, it is possible to obtain the desired bulk density. It should be noted that the term "preset opening angle" is understood as the opening angle the retention flap assumes when a dynamic pressure is applied. In the deactivated state of the compressor arrangement the

retention flap is thus closed. In this manner it is of course possible, in knowledge of the machine-specific data of the respective compressor arrangement, such as output, dimensions etc., to store weights as data in combination with a respective opening angle and thus a desired bulk density and to thereby guarantee a simple adjustment.

In another advantageous embodiment a weight element is provided that is connected with the transmission housing part via a lever arrangement. By a simple turning of the lever, a different moment acts on the retention flap shaft, whereby also a different force acts on the retention flap shaft, whereby the retention flap opens wider or lesser due to the dynamic pressure prevailing. In this regard it is conceivable that the weight element is adjustably arranged at the lever arrangement and the compressor arrangement thus has a greater flexibility and the adjustment range is enlarged.

Owing to the fact that the worm wheel may have a circular segment-shaped groove element into which a pin element engages which in turn is supported in the transmission housing part, such that the rotation of the transmission housing part during the preadjustment is limited by a first and a second end of the groove element, an inadvertent adjustment, e.g. due to a malfunction of the second drive means, is prevented in a simple manner.

In an advantageous embodiment the maximum opening angle of the retention flap may be limited by a stop element that cooperates with the retention flap shaft.

In an advantageous manner the second drive device is operatively connected with the transmission via a coupling, wherein the coupling may be designed as a releasable coupling.

Moreover, the second drive device may advantageously be an electric machine, in particular a stepper motor. To allow a simple representation of the preset opening angle, e.g. on a display, the adjustment device may comprise a sensor

element for monitoring the position of the retention flap shaft. This may be performed directly or indirectly, e.g. by a phase shift of the transmission.

According to one aspect of the present invention, there is provided compressor arrangement for automatic compressing of ground coffee having a first housing which has an inlet and outlet opening, wherein conveying and compressing elements are provided in the housing which are drivable by means of at least one first drive device, wherein the outlet opening has a retention flap which serves to adjust the bulk density of the ground coffee, wherein an adjustment device is provided via which a preadjustment of the bulk density can be adjusted, wherein the adjustment device has a second drive device which is operatively connected to a transmission which is operatively connected to a retention flap shaft on which the retention flap is arranged such that the transmission has means which enable a limiting of the opening angle of the retention flap, and wherein there is an automatic dynamic pressure adjustment apparatus which, in the case of a higher or lower dynamic pressure being exerted on the retention flap, enables an enlarging or reducing of the preset opening angle, and wherein the transmission is a worm gear including a worm shaft and a worm wheel, wherein a transmission housing part is provided which is rotatably supported on the retention flap shaft and in which the worm shaft is supported on the retention flap shaft for rotation therewith, such that a rotation of the worm shaft allows a rotation of the transmission housing part around the worm wheel, and wherein the transmission housing part has a defined weight assigned thereto that allows the preadjustment of the desired opening angle.

The invention will be explained in detail with reference to a drawing. In the Figures:

- Figure 1 shows a perspective arrangement of the compressor arrangement of the present invention,
- Figure 2 is a partially cut side view of an adjustment device of the compressor arrangement of Figure 1 in a first adjustment position, and
- Figure 3 shows the adjustment device of the compressor arrangement of

Figure 1 in a second position.

Figure 1 is a perspective view on a compressor arrangement 2 of the present invention for the automatic compression of ground coffee. The compressor arrangement 2 has a housing 4 substantially comprised of a plurality of housing parts 6, 8, 10, which may in turn be of a multi-part design. The first housing part 6 is trough-shaped and has an inlet opening 12 which, in a manner known per se, adjoins a grinder not illustrated in detail herein. A screw conveyor, not illustrated in detail herein, may be arranged in the housing part 6, which conveys the ground coffee on to the second housing part 8 in which a turbo mixer, not illustrated in detail herein, is arranged for homogeneous distribution of coffee skins and for compression of the ground coffee. The screw conveyor and the turbo mixer are connected in a manner known per se with a first drive device not illustrated in detail herein. The ground coffee is compressed by the turbo mixer in the direction of an outlet opening 14 provided in the second housing part 8, the opening being adjoined by a retention flap 16. The retention flap 16 is hinged to a retention flap shaft 18 which in turn is operatively connected with an adjustment device 20 which has a transmission housing part as the third housing part 10. In the non-actuated state of the compressor arrangement the retention

flap 16 closes the outlet opening 14. As will be explained in more detail hereinafter with reference to Figures 2 and 3, the adjustment device 20 allows a preadjustment of the opening angle of the retention flap 16, whereby an adjustment of the bulk density of the ground coffee becomes possible.

Figure 2 shows a sectional view of the adjustment device 20. The adjustment device 20 has a second drive device 22 operatively connected with a worm shaft 26 of a worm gear 28 via a coupling 24. In a manner known per se, the worm gear 28 comprises a worm wheel 30 supported on the retention flap shaft 18 for rotation therewith. The worm shaft 26 is rotatably supported in the transmission housing part 10, wherein the transmission housing part 10 is rotatably supported on the retention flap shaft 18. Further, the worm wheel 30 has a continuous, circular segment-shaped groove element 32 into or through which a pin element 34 engages that is fixedly connected with the transmission housing part 10. The angle of the circular segment of the groove element 32 is chosen to be larger than the adjustment angle of the adjustment device 20 explained hereinafter. In the present case the angle of the circular segment is ca. 140°. The groove element 32 with the engaging pin element 34 serves an inadvertent adjustment of the adjustment device 20 beyond the adjustment angle. For this purpose, the groove element 32 has a first end 36 and a second end 38. The transmission housing part 10 has a weight element 40 assigned thereto which is connected with the transmission housing part 10 via a lever arrangement 42 (see Figure 3). Further, the maximum opening angle of the retention flap 16 is limited by a stop element, not illustrated in detail herein, which cooperates with the retention flap shaft 18.

For preadjustment the second drive device 22 is actuated. At that moment, the retention flap 16 closes the outlet opening 14 and cannot deflect in this direction so that the retention flap shaft 18 and thus the worm wheel 30 do not move. The worm wheel 26 and thus the transmission housing part 10 consequently move in clockwise direction about the worm wheel 26, whereby the weight element 40 is adjusted on the circular path indicated. The weight force acting in the vertical downward direction is thereby associated with a variable lever which causes a

variable moment to act on the retention flap shaft 18 and thus causes a variable force to act on the retention flap 16. In Figure 2, the preset position is chosen such that a great lever acts on the weight element 40 and thus a great force acts on the retention flap 16, whereby a bulk density can be achieved that is at about 90% of the maximum compression.

When the first drive device of the compressor arrangement 2 is activated and the ground coffee is conveyed in a compressed state towards the outlet opening 14, a dynamic pressure is built in the region of the outlet opening 14 which eventually causes the retention flap 16 to open, whereby the retention flap shaft 18 turns the worm wheel 30 and thereby the entire adjustment device 20, formed by the transmission 28, the transmission housing part 10, the weight element 40 and the second drive device 22, is turned counterclockwise. In case of short-term variations of the ground coffee quantity, the dynamic pressure on the retention flap 16 will increase or decrease, which is compensated by an automatic shifting of the weight element 40. In the present embodiment the entire adjustment device 20 forms the mechanical automatic dynamic pressure adjustment arrangement.

Subsequently, the adjustment device 20 will pivot back into the preset position due to the weight force of the weight element 40.

Figure 3 illustrates the adjustment device 20 in side view, wherein the adjustment device is pivoted by an angle of ca. 45° and thus causes a compression of ca. 45% of the maximum compression. The lever element 42 by which the weight element 40 is hinged to the transmission housing part 10 is also clearly visible. Reference numeral 44 denotes a sensor element, e.g. a Hall sensor, which detects the pivot angle of the retention flap shaft 18 and thus monitors the opening angle of the retention flap 16. In the present embodiment the drive device 22 is designed as a stepper motor.

It should be clear that a variety of possible embodiments are conceivable in particular with regard to the design of the transmission, all of which fall within the scope of protection of the invention.

CLAIMS:

1. Compressor arrangement for automatic compressing of ground coffee having a first housing which has an inlet and outlet opening, wherein conveying and compressing elements are provided in the housing which are drivable by means of at least one first drive device, wherein the outlet opening has a retention flap which serves to adjust the bulk density of the ground coffee,

wherein an adjustment device is provided via which a preadjustment of the bulk density can be adjusted, wherein the adjustment device has a second drive device which is operatively connected to a transmission which is operatively connected to a retention flap shaft on which the retention flap is arranged such that the transmission has means which enable a limiting of the opening angle of the retention flap, and

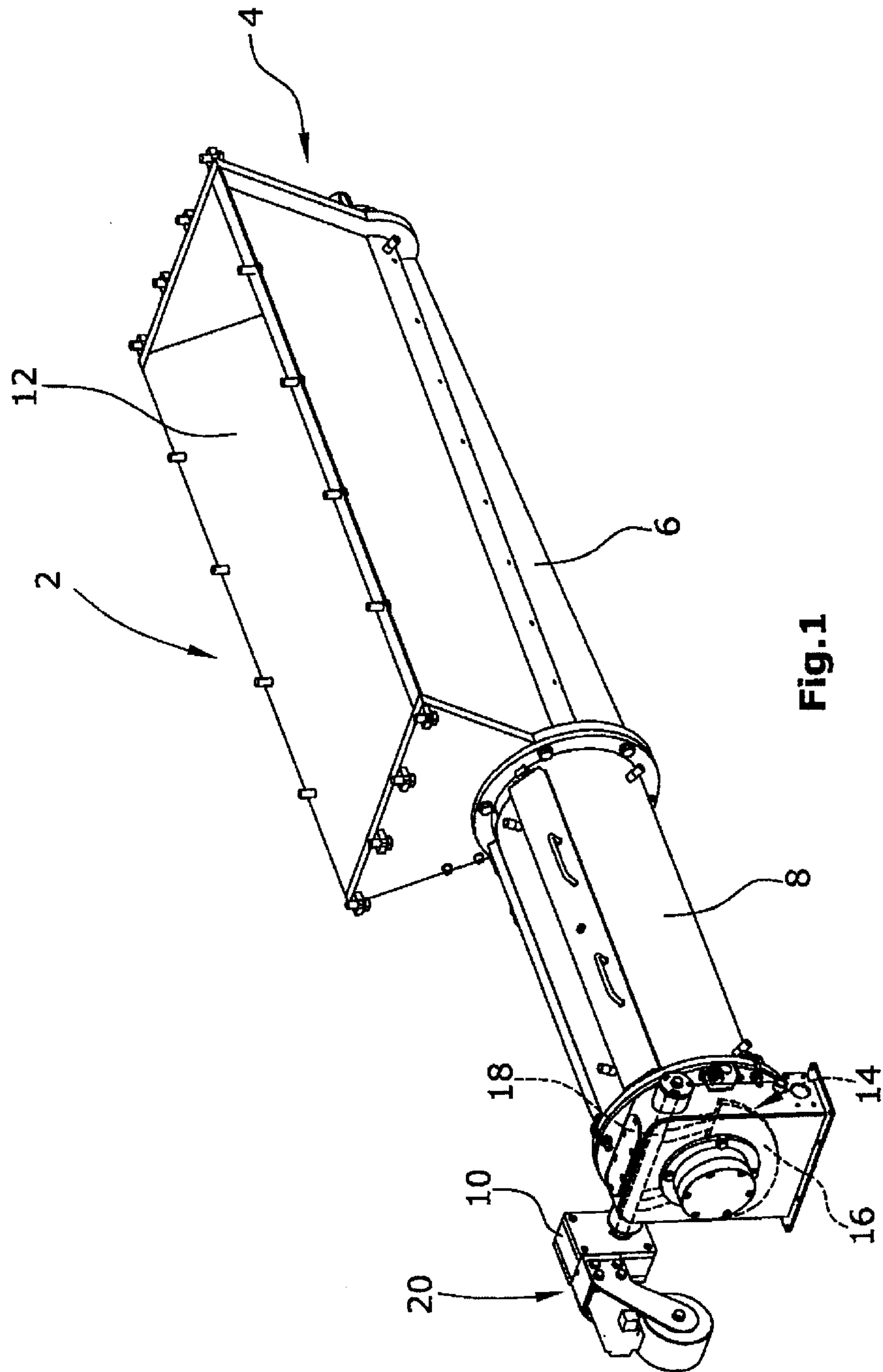
wherein there is an automatic dynamic pressure adjustment apparatus which, in the case of a higher or lower dynamic pressure being exerted on the retention flap, enables an enlarging or reducing of the preset opening angle, and

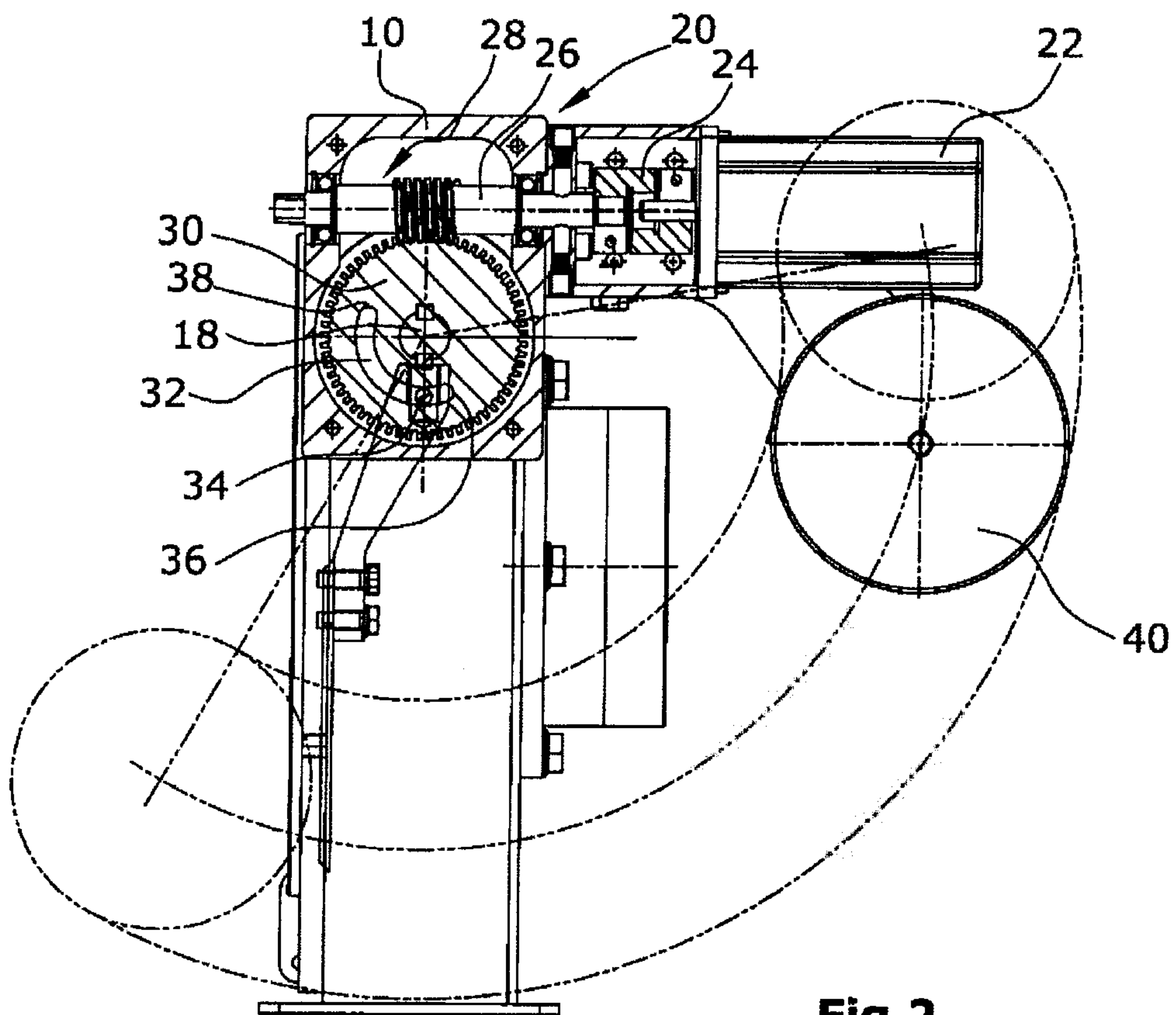
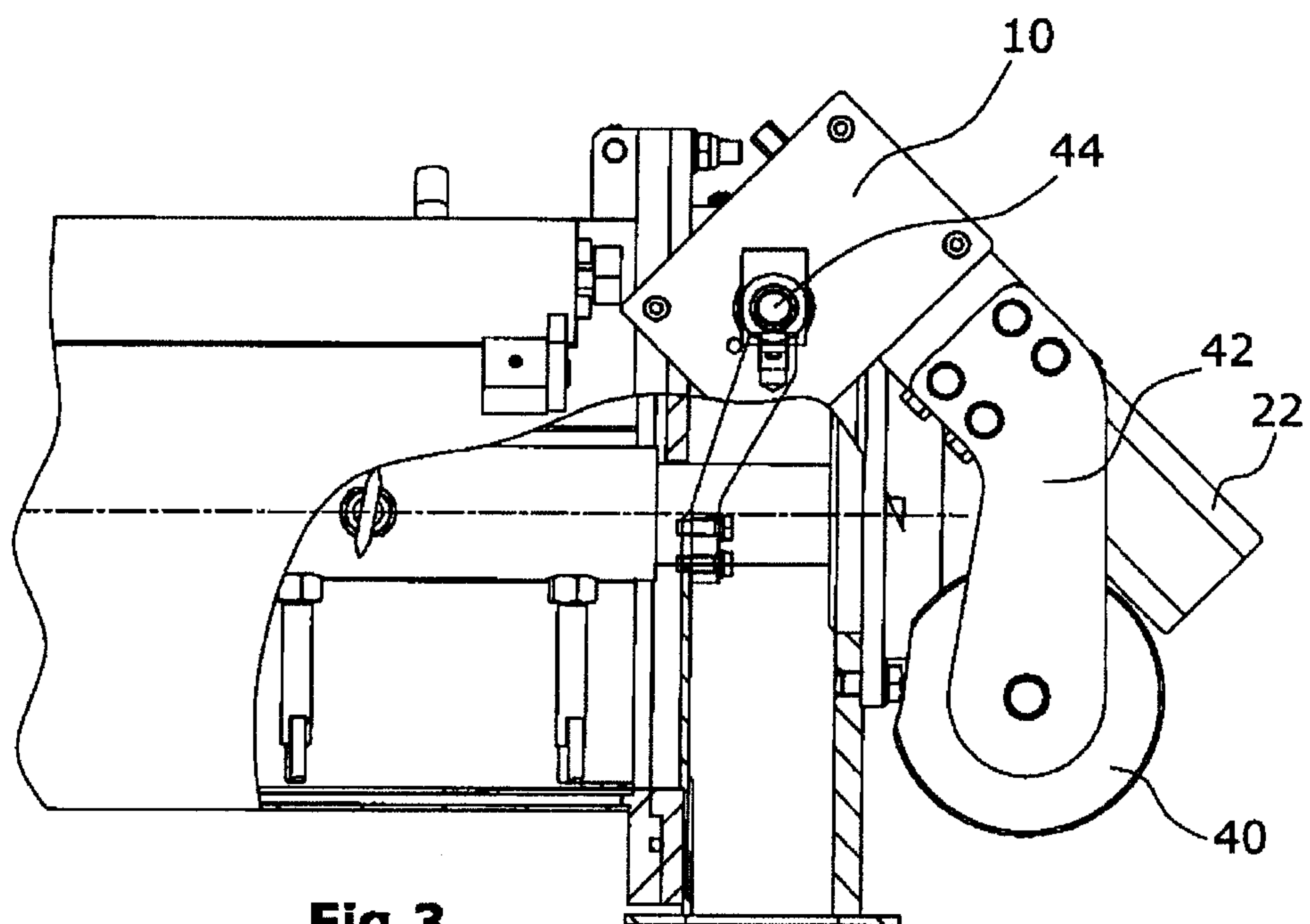
wherein the transmission is a worm gear including a worm shaft and a worm wheel, wherein a transmission housing part is provided which is rotatably supported on the retention flap shaft and in which the worm shaft is supported on the retention flap shaft for rotation therewith, such that a rotation of the worm shaft allows a rotation of the transmission housing part around the worm wheel, and wherein the transmission housing part has a defined weight assigned thereto that allows the preadjustment of the desired opening angle.

2. Compressor arrangement of claim 1, wherein a weight element is provided that is connected with the transmission housing part via a lever arrangement.

3. Compressor arrangement of claim 2, wherein the weight element is adjustably provided at the lever arrangement.

4. Compressor arrangement of any one of claims 1 to 3, wherein the worm wheel has a circular segment-shaped groove element into which a pin element engages which in turn is supported in the transmission housing part, such that the rotation of the transmission housing part during the preadjustment is limited by a first and a second end of the groove element.
5. Compressor arrangement of any one of claims 1 to 4, wherein the maximum opening angle of the retention flap is limited by a stop element that cooperates with the retention flap shaft.
6. Compressor arrangement of any one of claims 1 to 5, wherein the second drive device is operatively connected with the transmission via a coupling.
7. Compressor arrangement of claim 6, wherein the coupling is a releasable coupling.
8. Compressor arrangement of any one of claims 1 to 7, wherein the second drive device is an electric machine, in particular a stepper motor.
9. Compressor arrangement of any one of claims 1 to 8, wherein the adjustment device includes a sensor element for monitoring the position of the retention flap shaft.



**Fig.2****Fig.3**

