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METHOD FOR ADJUSTING A CRUSHING NIP

Description

5 The invention relates to a method for adjusting a crushing gap of a comminution device, in particular of an impact crusher, as well as a comminution device.

Comminution devices, such as impact crushers, are used for the fragmentation of materials such as rock and ore. In an impact crusher, the feedstock is fragmented
10 in a crushing gap formed between impact plates and a rotor outfitted with beater bars. The beater bars arranged on the periphery of the rotor as well as the impact plates are subjected to heavy wear during the operation of the comminution device, so that the crushing gap increases in size as the wear continues. In order to adjust a desired crushing gap, the impact mechanism on which the impact
15 plates are arranged can be moved by means of a hydraulic actuator relative to the rotor, so that the crushing gap and hence a desired grain size of the material being crushed can be adjusted.

The increase in size of the crushing gap resulting from ongoing wear makes it
20 considerably more difficult to set precisely a desired crushing gap, since first of all one must ascertain the wear or the geometry of the crushing gap.

Moreover, it is known from DE 195 11 097 C1 how to adjust the crushing gap of a comminution device by first of all determining the neutral position at which the
25 beater bars touch the impact plates and the crushing gap takes on a value of zero. This neutral position is determined in DE 195 11 097 C1 by moving the impact mechanism in the direction of the rotating rotor until these touch the beater bars. The vibrations of the impact mechanism are measured in this process and the neutral position is identified upon exceeding a predeterminable vibration
30 threshold value.

In practice, however, the determination of the neutral position with the aid of the vibrations of the impact mechanism is very expensive. When the impact mechanism is moved in the direction of the rotor there is a risk of ruining the impact mechanism if it is moved too far in the direction of the rotor and goes
5 beyond the neutral position. Therefore, the impact mechanism is usually moved in steps in the direction of the rotor, thereby being placed in vibration. Upon reaching the rotor, the vibration amplitude increases, but this increase is hard to distinguish from the previous vibration amplitudes. In order to identify the neutral position, one must in practice take into account the previously occurring
10 vibrations of the impact mechanism, and a complex calculation is necessary, making it more hard to identify precisely the neutral position. Document DE29505133U1 discloses a comminution machine of this kind, having a rotor provided with impact tools on its periphery, and mounted rotatably in a crusher housing, interacting with an impact mechanism which is mounted to swivel in the
15 crusher housing and whose distance from the impact tools can be adjusted.

Starting from this, the problem which the present invention proposes to solve is to provide a method for adjusting the crushing gap of a comminution device which is simple and reliable in its performance. Furthermore, the problem which the
20 present invention proposes to solve is to provide a comminution device in which the crushing gap can be easily and reliably adjusted.

This problem is solved according to the invention by a method with the features of the independent method Claim 1, as well as a comminution device according to
25 the independent device Claim 6. Advantageous modifications will emerge from the dependent claims.

The invention according to a first aspect involves a method for adjusting a crushing gap of a comminution device, in particular of an impact crusher, wherein
30 the comminution device comprises a rotor which can be rotated about its centre axis and has impact elements which are arranged over its circumference and

an impact mechanism which is fitted such that it can be moved relative to the rotor by means of a hydraulic actuator. The hydraulic actuator is connected to an adaptive pressure-limiting valve and a crushing gap is formed between the impact mechanism and the impact elements. The method has the following steps:

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- a) rotating the rotor,
- b) moving the impact mechanism in the direction of the rotor,
- c) ascertaining the pressure profile in the hydraulic actuator,
- d) adjusting the valve threshold value of the adaptive pressure-limiting valve at
10 which the adaptive pressure-limiting valve moves into an open position,
depending on the pressure on the hydraulic actuator,
- e) detecting the neutral position, in which the impact mechanism comes into
contact with at least one impact element when the adaptive pressure-limiting
valve is moved into the open position or when the gradient of the pressure profile
15 on the hydraulic actuator exceeds a predetermined gradient threshold value,
wherein the position of the impact mechanism over time is ascertained and from
which the position of the impact mechanism in the neutral position detected in
step e) is determined, and
- f) moving the impact mechanism in the opposite direction to step b), so that a
20 desired crushing gap is established.

In order to adjust the crushing gap of the comminution device, at first the neutral position is in particular determined. The neutral position is the position of the impact mechanism in which the impact mechanism touches at least one impact
25 element of the rotor, so that the crushing gap in this position takes on a value of zero. Starting from the ascertained neutral position, the crushing gap is adjusted by moving the impact mechanism away from the rotor, so that the desired crushing gap is set. In the neutral position, one of the impact elements touches the impact mechanism in rotation of the rotor, whereupon the impact mechanism is
30 subjected to an impact force in particular that results in a pressure increase in the hydraulic actuator.

The hydraulic actuator comprises in particular a hydraulic cylinder with a piston arranged movably inside it. The piston divides the hydraulic cylinder into two chambers and is connected by its one end to the impact mechanism, so that a movement of the piston results in a movement of the impact mechanism. When
5 the cylinder chamber facing away from the impact mechanism takes on pressure, the impact mechanism moves in the direction of the rotor. In the neutral position, in particular, the cylinder chamber facing away from the impact mechanism will take on pressure.

10 The impact elements are, for example, beater bars, crusher teeth, or hammer tools arranged about the periphery of a rotor.

The hydraulic actuator is connected in particular to a pressure measuring device, which determines the pressure profile in the cylinder chambers of the hydraulic
15 cylinder over time. Preferably, the pressure profile determined with the pressure measuring device is relayed to the adaptive pressure-limiting valve.

The adaptive pressure-limiting valve preferably has a valve threshold value corresponding to a predetermined differential pressure on the adaptive pressure-
20 limiting valve. Upon reaching the valve threshold value, the adaptive pressure-limiting valve is moved into an open position, in which hydraulic fluid flows through the adaptive pressure-limiting valve and the pressure is decreased on the hydraulic actuator, especially in the cylinder chamber facing away from the impact mechanism. The adaptive pressure-limiting valve is preferably designed
25 such that the valve threshold value is set according to the pressure on the hydraulic actuator, especially that in the cylinder chambers.

The adaptive pressure-limiting valve in particular comprises at least two surfaces which are subjected to pressure. The first surface is subjected to the pressure
30 which is present on the hydraulic actuator, especially in the cylinder chamber facing away from the impact mechanism, while the second surface is subjected to a reference pressure, especially the pressure exerted by means of a hydraulic

pump of the hydraulic system. If the difference between the pressure present on the hydraulic cylinder and the reference pressure exceeds the valve threshold value, the adaptive pressure-limiting valve is moved into the open position. The valve threshold value in particular is a threshold value of the pressure difference
5 between the pressure present on the hydraulic cylinder and the reference pressure.

For example, the valve threshold value is around 5 - 10 bar, especially 7 bar, so that the adaptive pressure-limiting valve is moved into the open position when the pressure on the hydraulic actuator is around 5-10 bar, especially 7 bar, higher
10 than the reference pressure. The reference pressure is preferably independent of the reaching of the neutral position of the impact mechanism, so that this is not changed at all by striking against the impact mechanism, or only by the subsequent opening of the adaptive pressure-limiting valve.

15 The adaptive pressure-limiting valve for example has a spring of variable spring constant, by which the valve threshold value can be adjusted. Preferably, the spring forces the adaptive pressure-limiting valve in the direction of the closed position.

20 The design of such an adaptive pressure-limiting valve affords the benefit of a simple and reliable determination of the neutral position of the impact mechanism, wherein the pressure in the actuator is automatically decreased upon reaching the neutral position and further travel of the impact mechanism in the direction of the rotor is reliably prevented.

25 Step d) of adjusting the valve threshold value of the adaptive pressure-limiting valve at which the adaptive pressure-limiting valve moves into an open position, depending on the pressure on the hydraulic actuator, makes it possible to prevent the reaching of the valve threshold value before reaching the neutral position
30 during the movement of the impact mechanism in the direction of the rotor, even though the pressure in the actuator slightly rises, for example. Upon a large pressure rise in the actuator, such that the gradient threshold value per step e) is

exceeded, especially by around 5 bar/sec, the valve threshold value will be reached and the adaptive pressure-limiting valve will be opened.

5 Thanks to this dependency of the valve threshold value on the pressure, especially the pressure profile, at the actuator, a reliable detection of the neutral position and a subsequent automatic movement of the impact mechanism away from the rotor is made possible, while only a touching of the impact mechanism with the beater bars is sufficient to move the adaptive pressure-limiting valve into the open position. Therefore, the measuring of an entire oscillation or even several
10 oscillations and thus also several instances of contact of the impact mechanism with the rotor is not necessary. This is especially sparing of material, since only one blow of the impact elements of the rotor against the impact mechanism is needed in order to detect the neutral position.

15 In particular, the valve threshold value is adjusted such that the adaptive pressure-limiting valve is in the closed position if the pressure profile of the hydraulic actuator drops below the gradient threshold value and the adaptive pressure-limiting valve is in the open position if the pressure profile of the hydraulic actuator rises beyond the gradient threshold value.

20 The position of the impact mechanism over time is ascertained and from this the position of the impact mechanism in the neutral position detected in step e) is determined. In particular, step f) of the moving of the impact mechanism away from the rotor is carried out according to the ascertained position of the impact
25 mechanism in the neutral position, so that a desired crushing gap is adjusted relative to the ascertained neutral position. The determination of the position of the impact mechanism in the neutral position affords the possibility of an adjusting of the crushing gap with respect to the neutral position. Furthermore, it is possible to determine the wear on the impact mechanism and the impact
30 elements on the rotor during the further operation of the comminution device, in which case positions of the impact mechanism in the neutral position that are determined over time are compared.

According to another embodiment, the impact mechanism is moved in the direction of the rotor at constant speed. According to another embodiment, step f) is carried out following the first contact of the impact mechanism with an impact
5 element of the rotor, so that the impact mechanism and the impact element have exactly one contact.

The gradient threshold value of the pressure rise in the actuator according to another embodiment has a value of about 3-8 bar/sec, in particular about 4-6
10 bar/sec, preferably about 5 bar/sec. In particular, the neutral position of the impact mechanism is detected when the gradient of the pressure profile on the actuator exceeds the gradient threshold value for a period of < 1 second.

The invention further relates to a comminution device comprising a rotor which
15 can be rotated about its centre axis and has impact elements which are arranged over its circumference, an impact mechanism which is fitted such that it can be moved relative to the rotor by means of a hydraulic actuator, a crushing gap formed between the impact mechanism and the impact elements, and a pressure measuring device for ascertaining the pressure profile in the hydraulic actuator,
20 the hydraulic actuator being connected to an adaptive pressure-limiting valve. The comminution device comprises a displacement measuring device for ascertaining the position of the impact mechanism and a control device for controlling the hydraulic actuator, which is formed in such a way that it ascertains the gradient of the pressure profile and detects a neutral position of the impact mechanism, in
25 which the impact mechanism touches an impact element of the rotor when the adaptive pressure-limiting valve is moved into the open position or when a predetermined pressure threshold value is exceeded.

The benefits mentioned above with regard to the method for adjusting a crushing
30 gap of a comminution device apply accordingly to the comminution device.

In particular, the adaptive pressure-limiting valve is connected to the pressure measuring device. The pressure measuring device in particular relays the ascertained pressure profile on the hydraulic actuator to the adaptive pressure-limiting valve, so that for example the valve threshold value is set according to the ascertained pressure. For example, the adaptive pressure-limiting valve is opened or closed according to the ascertained pressure profile.

According to a further embodiment, the adaptive pressure-limiting valve is formed in such a way that the valve threshold value at which the adaptive pressure-limiting valve moves into an open position is adjusted, depending on the pressure, especially the pressure profile in the hydraulic actuator.

According to a further embodiment, the valve threshold value is about 5-10 bar, in particular 7 bar.

The comminution device comprises a displacement measuring device to ascertain the position of the impact mechanism and a control device to control the hydraulic actuator, which is designed such that it ascertains the gradient of the pressure profile and detects a neutral position of the impact mechanism in which the impact mechanism touches an impact element of the rotor when the adaptive pressure-limiting valve moves into the open position or when the gradient of the pressure in the hydraulic actuator exceeds the gradient threshold value.

According to a further embodiment, the hydraulic actuator comprises a hydraulic cylinder and a piston arranged therein, wherein the piston is connected to the impact mechanism and the displacement measuring device is fitted to the piston.

According to a further embodiment, the pressure measuring device is arranged in such a way that it ascertains the pressure in that cylinder chamber of the hydraulic actuator which faces away from the impact mechanism.

Description of the drawings

The invention is explained more closely below with the aid of several possible exemplary embodiments with reference to the accompanying figures.

5 Fig. 1 shows a schematic representation of a comminution device according to one exemplary embodiment.

Fig. 2 shows a diagram of a pressure profile on a hydraulic cylinder of the comminution device of Fig. 1.

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Fig. 1 shows a comminution device 10, especially an impact crusher, with a rotor 14 and an impact mechanism 12. The rotor 14 is substantially cylindrical and can rotate about its centre axis. On its lateral surface, the rotor 14 has a plurality of impact elements 16 arranged about its periphery. In particular, in the exemplary
15 embodiment shown in Fig. 1, the impact elements 16 are beater bars. The impact elements 16 are arranged in a radial recess in the lateral surface of the rotor 14 and extend in the radial direction out from the rotor 14 for roughly half their length. The direction of rotation is indicated by an arrow in Fig. 1.

20 The impact mechanism 12 is arranged next to the rotor 14 and comprises a plurality of impact plates 34, which are arranged pointing in the direction of the rotor 14. Between the impact plates 34 of the impact mechanism 12 and the impact elements 16 of the rotor 14 there is formed a crushing gap 38. The impact plates 34 of the impact mechanism 12 are arranged in succession in the direction
25 of rotation, the spacing between the impact plates 34 and the beater bars 16 of the rotor 14 decreasing in the direction of rotation until the lowermost of the impact plates 34 in Fig. 1 forms with the rotating impact elements 16 the crushing gap 38. The impact mechanism 12 is mounted rotatably about a swivel axis 32, so that the impact plates 34 can be oriented relative to the rotor 14. Moreover, the impact
30 mechanism 12 is mounted movably about the swivel axis 32 with a hydraulic actuator 18 in the direction of the rotor 14. The hydraulic actuator 18 comprises a hydraulic cylinder 40 with a movable piston 20 therein, which divides the

hydraulic cylinder 40 into two cylinder chambers. The piston 20 is arranged by its one end on the impact mechanism 12 and it comprises a displacement measuring device 22 for determining the movement of the piston 20 in the hydraulic cylinder 40. Moreover, a pressure measuring device 24 is arranged on the actuator 18, which determines the pressure in the cylinder chamber of the actuator away from the impact mechanism 12.

The actuator 18 is connected to an adaptive pressure-limiting valve 26. Moreover, the actuator 18 is connected via a directional valve 42 to a hydraulic pump 30. Between the directional valve 42 and the adaptive pressure-limiting valve 26 there is arranged an unlockable check valve 27. The check valve 27 prevents a hydraulic flow from the adaptive pressure-limiting valve 26 back to the directional valve 42. Upon reaching a predetermined pressure in the line B from the hydraulic actuator 18 to the directional valve 42, the check valve 27 is unlocked.

The adaptive pressure-limiting valve 26 in the exemplary embodiment of Fig. 1 comprises a movable piston, having four surfaces A, B, AP and BP. The surfaces A and B point in the direction of the lines connected to the hydraulic actuator, while the surfaces AP and BP point in the direction of a control line represented by broken lines, leading from the adaptive pressure-limiting valve to the line between the directional valve 42 and the pump 30. The surface AP minus the surface BP corresponds to roughly the surface A together with the surface B. The surface AP is forced by a spring in the direction of the closed position.

In the operation of the impact crusher, the rotor 14 rotates in the direction of the arrow, and feedstock is placed onto the rotor 14, which is thrown by the rotation of the rotor 14 against the impact plates 34 of the impact mechanism 12. In order to adjust the crushing gap 38, the impact mechanism 12 is moved in the direction of the rotor 14 or away from the rotor 14. For this, the directional valve 42 is moved into the position shown at left, in which the directional valve 42 is opened, so that hydraulic fluid is forced by the pump 30 into the cylinder chamber of the

actuator 18 situated away from the impact mechanism 12, whereby the piston 20 is moved in the direction of the rotor 14 and the crushing gap 38 becomes smaller. In order to move the impact mechanism 12 away from the rotor 14 in order to increase the crushing gap 38, the directional valve 42 is moved into the position at right in Fig. 1, in which the valve is opened so that the forward and return lines are crossed, such that the piston 20 is moved in the direction away from the rotor 14. In the valve position shown in Fig. 1, the piston 20 is not moved.

The pressure-limiting valve 26 is connected to both cylinder chambers of the actuator 18. If the pressure on the pressure-limiting valve 26 exceeds a predetermined valve threshold value, the pressure-limiting valve 26 opens and the hydraulic fluid flows from line A across the opened seat of the pressure-limiting valve into line B. The valve threshold value of the pressure-limiting valve 26 at which the pressure-limiting valve 26 opens is dependent on the pressure present on the hydraulic actuator 18. If the same pressure is present on the hydraulic actuator 18 and the control line connected to the pump 30, an equilibrium of forces will be present on the surfaces A, B, AP and BP of the cylinder of the adaptive pressure-limiting valve 26, so that the piston is forced by the spring into the closed position. The pressure present in the control line is also known as the reference pressure. In the event of an equilibrium of forces present on the piston of the adaptive pressure-limiting valve 26, the valve threshold value will be determined by the spring force, so that this is always higher by the spring force than the pressure present on the hydraulic actuator. The valve threshold value is for example around 5 - 10 bar, especially 7 bar, higher than the pressure present on the actuator 18.

However, if the pressure in the actuator 18 rises significantly, due to a blow against the impact mechanism 12 connected to the piston 20, the surface A will be subjected to a higher pressure than the surfaces AP and BP, subjected to the pressure of the pump 30. The pressure on surface B is preferably very low or almost zero. If this pressure difference exceeds the spring force, the adaptive pressure-limiting valve 26 will be moved into an open position.

In order to adjust the crushing gap 38, the rotor 14 is rotated about its axis of rotation, and no material for crushing is fed to the crushing gap during the adjusting of the crushing gap. After this, the pump 30 is started and the directional valve 42 is moved into the lefthand parallel position, so that the cylinder chamber facing away from the impact mechanism 12 is supplied with pressure and the piston 20 moves with roughly constant speed in the direction of the rotor 14. Between the hydraulic pump 30 and the directional valve 42 there is arranged a restrictor valve 29, by which the speed of the piston 20 is adjusted, so that the piston 20 is moved with a constant speed in the direction of the rotor 14. In order to safeguard the maximum system pressure, a further pressure-limiting valve 36 is arranged in parallel with the restrictor valve 29. Furthermore, between the pump 30 and the restrictor valve 29 there is arranged an accumulator 28, serving as a buffer. The pressure measuring device 24 ascertains the pressure on the actuator 18, especially in the cylinder chamber facing away from the impact mechanism 12, over time, while the displacement measuring device 22 ascertains the position of the piston 20 over time. Upon contact of at least one of the impact plates 34 of the impact mechanism 12 with one of the beater bars 16, the pressure in the actuator 18 rises such that the adaptive pressure-limiting valve 26 opens, so that the piston 20 moves in the opposite direction away from the rotor 14. By means of the pressure profile determined by the pressure measuring device 24, the time of the contact between the impact plate 34 of the impact mechanism 12 and the beater bar 16 is determined. The position of the neutral position of the impact mechanism 12 is ascertained by means of the position of the piston 20 at the time of the pressure rise, as determined by the displacement measuring device 22. If the gradient of the pressure profile exceeds a given gradient threshold value, the neutral position of the impact mechanism 12 is detected. The neutral position is also detected, for example, when the adaptive pressure-limiting valve 26 is moved into the open position.

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Fig. 2 shows the pressure profile as determined with the pressure measuring device 24 during the process of adjusting the crushing gap 38, whereby the impact

mechanism 12 is moved in the direction of the rotor 14 while the rotor 14 is rotating about its axis of rotation. The solid line shows the pressure on the actuator 18, especially in the cylinder chamber facing away from the impact mechanism 12, over time. The broken line shows the valve threshold value
5 adjusted at the adaptive pressure-limiting valve 26 over time. During the process of adjusting the crushing gap 38, the displacement measuring sensor ascertains the position of the piston 20 in the hydraulic cylinder 40 over time. At 0 seconds, the pump 30 is switched on, while the directional valve 42 is in the blocked position shown in Fig.1 and the pressure in the actuator 18 is constant. After
10 around 3 seconds, the directional valve 42 is moved into the parallel position, so that the cylinder chamber facing away from the impact mechanism 12 is supplied with pressure and the piston 20 moves at roughly constant speed in the direction of the rotor 14. The pressure on the actuator 18, especially in the cylinder chamber facing away from the impact mechanism 12, rises in a roughly linear
15 manner, while the gradient amounts to around 2-3 bar per second, for example. The valve threshold value of the adaptive pressure-limiting valve 26 varies roughly in parallel with the pressure profile of the actuator 18, while the valve threshold value is around 5 bar higher than the actuator pressure. The pressure rise in the actuator 18 is due for example to the fact that the impact mechanism 12
20 is lifted against the force of gravity. After around 11 seconds, one of the impact elements 16 touches an impact plate 34 of the impact mechanism 12 and the pressure profile has a gradient which is significantly higher than the gradient of the pressure profile during the movement of the impact mechanism 12 in the direction of the rotor 14. For example, the gradient amounts to around 100 bar per
25 second. The pressure on the actuator 18 rises to a value of around 70 bar, whereupon the valve threshold value of the adaptive pressure-limiting valve 26 is exceeded and the pressure-limiting valve 26 is opened, so that the piston 20 is moved in the opposite direction away from the rotor 14. The pressure in the actuator 18 decreases to a value corresponding roughly to the starting pressure
30 value in the actuator 18, whereupon the pressure-limiting valve 26 is closed and has a threshold value which is around 5 bar higher than the actuator pressure.

The pressure on the actuator 18 increases significantly upon contact of one of the impact elements 16 with an impact plate 34, so that the time of the contact of the beater bar 16 with the impact plate 34 can be determined distinctly from the pressure profile. In the exemplary pressure profile shown in Fig. 2, the time of the contact is 11 seconds. In particular, a contact between one of the beater bars 16 and an impact plate 34 is recognized when the pressure rise of the actuator pressure exceeds a predetermined value. In particular, this gradient threshold value is around 5 bar/sec.

In order to determine the neutral position of the piston at which one of the impact elements 16 is in contact with an impact plate 34, the position of the piston 20 in the cylinder 40 as ascertained by means of the displacement measuring device 22 is determined at 11 seconds. Given the known neutral position of the piston, the crushing gap 38 is then adjusted.

List of reference numbers

10	Comminution device
12	Impact mechanism
20	14 Rotor
	16 Impact elements, beater bars
	18 Hydraulic actuator
	20 Piston
	22 Displacement measuring device
25	24 Pressure measuring device
	26 Adaptive pressure-limiting valve
	27 Unlockable check valve
	28 Hydraulic accumulator
	29 Restrictor valve
30	30 Hydraulic pump
	32 Swivel axis
	34 Impact plates

36	Pressure-limiting valve
38	Crushing gap
40	Hydraulic cylinder
42	Directional valve

PATENTKRAV

1. Fremgangsmåde til justering af et knusende mellemrum (38) i en findelingsanordning (10), især en slagknuser, omfattende en rotor (14), der kan drejes om sin midterakse og har slagelementer (16), der er anbragt over sin omkreds,

- 5 en slagmekanisme (12), som er monteret således, at den kan bevæges i forhold til rotoren (14) ved hjælp af en hydraulisk aktuator (18), hvor den hydrauliske aktuator (18) er forbundet med en adaptiv trykbegrænsningsventil (26), og et knusende mellemrum (38), der er dannet mellem slagmekanismen (12) og slagelementerne (16), hvor fremgangsmåden har følgende trin:

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- a) roter rotoren (14),
- b) bevægelse af slagmekanismen (12) i retning af rotoren (14),
- c) bestemme trykprofilen i den hydrauliske aktuator (18),
- d) justering af ventilgrænseværdien af den adaptive trykbegrænsningsventil (26), ved hvilken den adaptive trykbegrænsningsventil (26) bevæger sig ind i
- 15 en åben position afhængigt af trykket på den hydrauliske aktuator (18),
- e) detektering af den neutrale position, hvori slagmekanismen (12) kommer i kontakt med mindst et slagelement (16), når den adaptive trykbegrænsningsventil bevæges ind i åben position eller når gradienten af trykprofilen på den
- 20 hydrauliske aktuator (18) overstiger en forudbestemt gradientgrænseværdi, hvor positionen af slagmekanismen (12) over tid er fastslået, og hvorfra stødmekanismens (12) position i den neutrale position detekteret i trin e) bestemmes, og
- f) bevægelse af slagmekanismen (12) i den modsatte retning til trin b), således
- 25 at der etableres et ønsket knusende mellemrum (38).

2. Fremgangsmåde ifølge krav 1,

hvor slagmekanismen (12) bevæges i retning af rotoren (14) med konstant hastighed.

30 3. Fremgangsmåde ifølge et af de foregående krav,

hvor trin f) udføres efter den første kontakt af slagmekanismen (12) med et slagelement (16) af rotoren (14), således at slagmekanismen (12) og slagelementet (16) har nøjagtigt en kontakt.

4. Fremgangsmåde ifølge et af de foregående krav,
hvor gradientgrænseværdien har en værdi på ca. 3-8 bar / sek., især ca. 4-6 bar / sek.,
fortrinsvis ca. 5 bar / sek.

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5. Findelingsanordning (10) omfattende

en rotor (14), der kan roteres om sin midterakse og har slagelementer (16), som er
anbragt over sin omkreds,

en slagmekanisme (12), som er monteret således, at den kan bevæges i forhold til roto-
ren (14) ved hjælp af en hydraulisk aktuator (18)

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et knusende mellemrum (38) dannet mellem slagmekanismen (12) og slagelementerne
(16) og

en trykmåleanordning (24) til bestemmelse af trykprofilen i den hydrauliske aktuator
(18), hvor den hydrauliske aktuator (18) er forbundet med en adaptiv trykbegræns-

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ningsventil (26), **kendetegnet ved**, at findelingsanordningen (10) omfatter en for-
skydningsmåleanordning (22) til bestemmelse af stødmekanismens (12) position og en

styreanordning til styring af den hydrauliske aktuator (18), som er udformet på en så-
dan måde, at den bestemmer gradienten af trykprofilen og detekterer en neutral posi-

tionen af slagmekanismen (12), hvori slagmekanismen (12) rører et slagelement (16) af
roto-
ren (14), når den adaptive trykbegrænsningsventil bevæges i åben position eller

20

når en forudbestemt trykgrænseværdi overskrides.

6. Findelingsanordning (10) ifølge krav 5,

hvor den adaptive trykbegrænsningsventil (26) er dannet på en sådan måde, at ventil-
grænseværdien, hvor den adaptive trykbegrænsningsventil (26) bevæger sig ind i en
åben position, justeres afhængigt af trykket i den hydrauliske aktuator (18)).

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7. Findelingsanordning (10) ifølge krav 6,

hvor ventilgrænseværdien er ca. 5-10 bar, især 7 bar.

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8. Findelingsanordning (10) ifølge et af kravene 5 til 7, hvor den hydrauliske aktuator
(18) omfatter en hydraulisk cylinder (40) og et stempel (20) der er anbragt deri, hvor
stemplet (20) er forbundet med slagmekanismen (12) og forskydningsmåleanordnin-
gen (22) er monteret på stemplet (20).

9. Findelingsanordning (10) ifølge et af kravene 5 til 8, hvor trykmåleanordningen (24) er anbragt på en sådan måde, at den bestemmer trykket i den hydrauliske aktuator (18) cylinderkammer, som vender væk fra slagmekanismen (12).

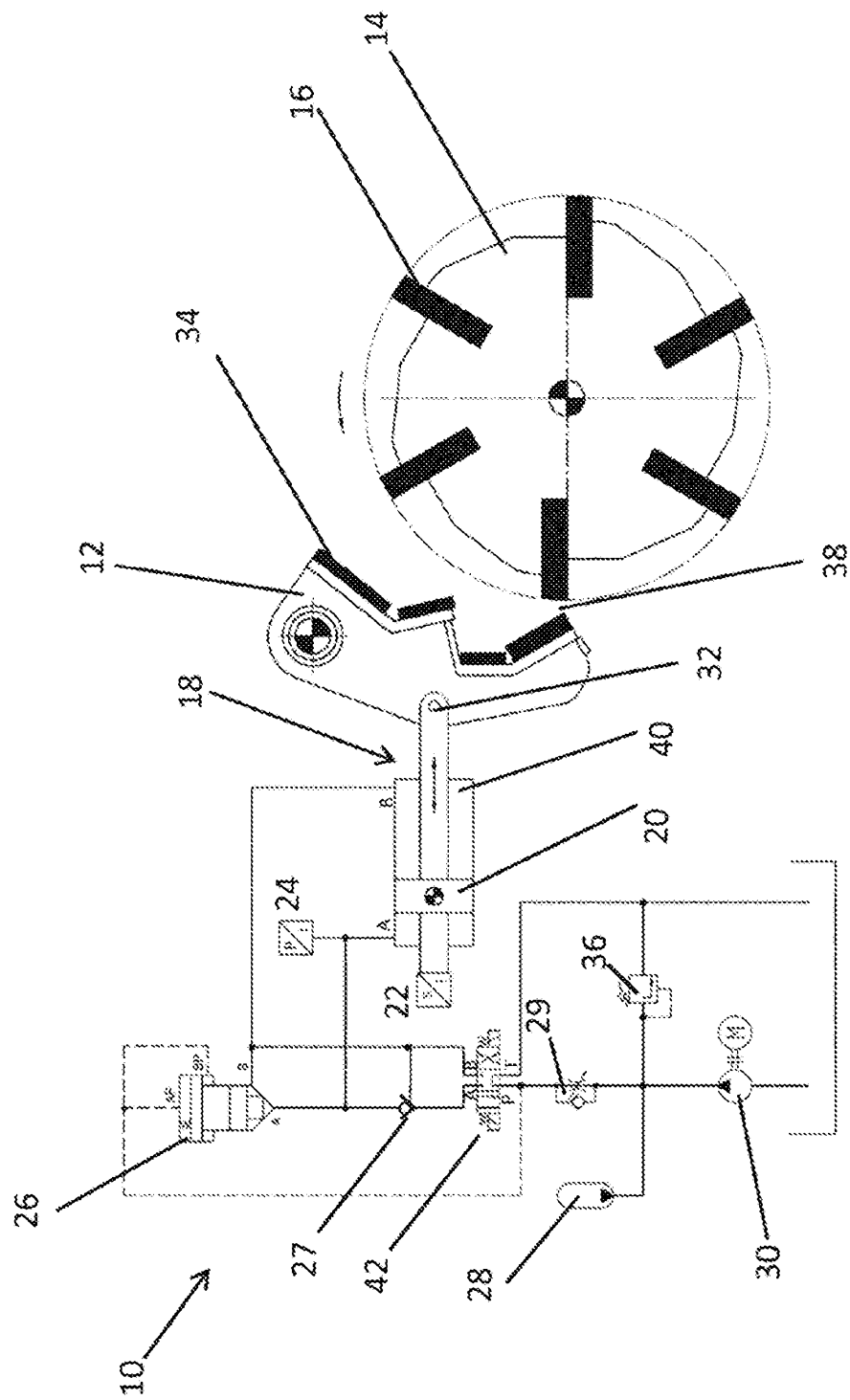


Fig. 1

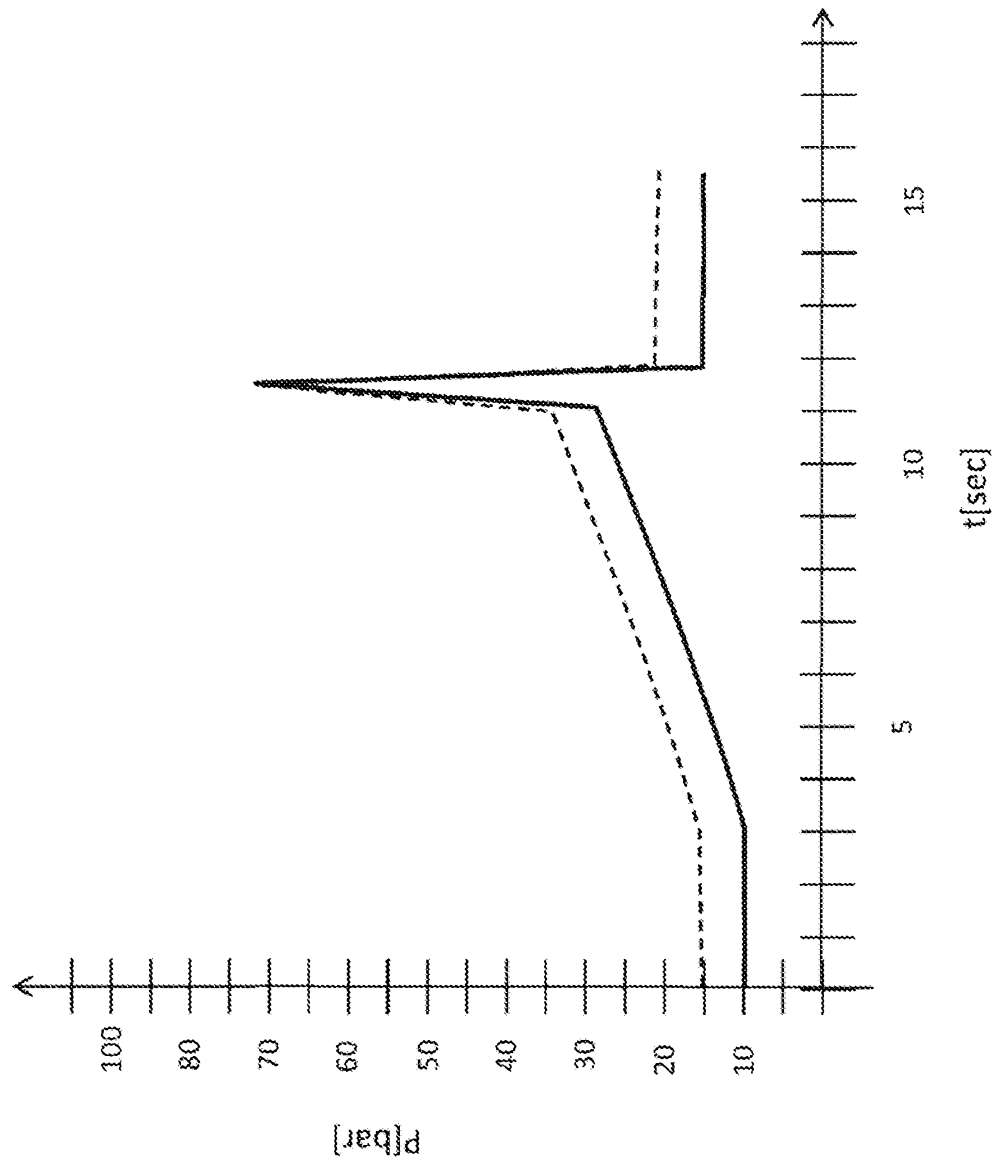


Fig. 2