

Description

The invention relates to a clamping device for an axially displaceable actuator for gripper changeover control on a gripper cylinder of a turning apparatus in a sheet-fed rotary printing machine which has the design features according to the preamble of Patent Claim 1.

Such a clamping device is known from DE-C-3,814,831. In the known arrangement, a prestressed spring, which permanently loads the clamping device with its reaction force in the operating state, is a component of a device for adjusting the rotary position of the gripper cylinder of a turning apparatus with clamping between a fixed gear and an adjusting gear arranged equiaxially therewith. The spring bringing about this clamping is supported by one end against a radial flange on a pressure rod which is movably guided in the gripper cylinder axially parallel to the longitudinal axis of the gripper cylinder and acts with the inner end on an abutment on a double lever which is pivotable about a transverse axis in the gripper cylinder and has on a second arm a bearing for clamping pieces which are movably guided in the adjusting member directly or via further intermediate members radially relative to the longitudinal axis of the gripper cylinder, such that the reaction force of the spring of the gear clamping acts via the pressure rod and the pressure lever on the clamping pieces and brings about the clamping of the adjusting member on the gripper cylinder corresponding to the clamping between the adjusting gear and the fixed gear. The spring tension can be reduced by an adjusting mechanism integrated in an electric fuse protection, such that the clamping of the gears and thus, at the same time, of the adjusting member on the gripper cylinder is released and the changeover operation is made possible, specifically, for example, by the rotation of an eccentric mechanism by means of a socket spanner or the like either directly on the gripper cylinder or via a positioning shaft leading out of the gripper cylinder on the drive side. When the clamping of the gears is

subsequently closed again, the clamping of the adjusting member is also automatically closed and also electrically protected.

5 In the arrangement according to the publication cited, the clamping of the adjusting member extending over the length of the gripper cylinder is provided only at one place and illustrated in the publication near to the cylinder end on the drive side. No clamping is provided on the operating side, but the adjusting member is guided only between adjustable guide strips on the drive side and on the operating side. In order to make axial movement of the adjusting member possible, there must be slight play present between said adjusting member and the guide strips. The adjusting member can move within this play on the operating side while the machine is running, in particular at high machine running speeds. These micromovements lead to frictional corrosion, that is to say to abrasion with formation of very fine dust, such that the free mobility of the adjusting member on the gripper cylinder no longer exists and can no longer be adjusted in the conventional manner.

The invention is based on the object of preventing such micromovements and thus the occurrence of frictional corrosion.

25 The invention achieves this object by the design features according to the characterizing clause of Patent Claim 1.

30 It is thus achieved that the adjusting member extending axially on the gripper cylinder is held by clamping on the gripper cylinder not only on the drive side, but also on the operating side, thus at least at two places in order, in this manner, to prevent micromovements which favour the occurrence of frictional corrosion.

35 In a preferred embodiment of the concept of the invention on a clamping device having an intermediate member consisting of a two-armed pressure lever which is mounted in the gripper cylinder so as to be movable about a bearing bolt, arranged transversely to its longitudinal

axis, one arm of which pressure lever forms an abutment for the pressure rod and the other arm of which pressure lever has a bearing, which is movable radially in the gripper cylinder, for clamping pieces which are movable
5 on the drive side in the adjusting member radially relative to the longitudinal axis of the gripper cylinder, provision is made, in accordance with Patent Claim 2, for the bearing bolt of the pressure lever to be designed as a roller bolt and to be movable in the
10 gripper cylinder axially relative to its longitudinal axis and to be coupled with rotary movement to a pressure member which is axially displaceable in the gripper cylinder and acts on a further pressure lever which is mounted on the operating side in the gripper cylinder so
15 as to be movable about a fixed transverse axis, has an abutment for the pressure member and, offset at an angle thereto, a bearing for clamping pieces which are guided on the operating side radially relative to the longitudinal axis of the gripper cylinder in the adjusting
20 member.

In such a design, the reaction force of the spring which brings about the clamping between the fixed gear and the adjusting gear is transmitted at the same time to a plurality of clamping pieces which are arranged
25 with spacing from one another in the direction of the longitudinal axis of the gripper cylinder, such that the clamping of the axially movably arranged adjusting member with the gripper cylinder takes place at a plurality of places at the same time as the clamping of the driving
30 gears.

Claims 3 to 5 contain further advantageous features for the constructional design of the concept of the invention.

The drawing shows exemplary embodiments of the
35 invention, specifically

Figure 1 shows a section in an axial plane through a gripper cylinder of a turning apparatus in the state of non-positive clamping,

Figure 2 shows a section along the line II-II of

Figure 1,

Figure 3 shows a section along the line III-III of Figure 1,

Figure 4 shows a section along the line IV-IV of Figure 1, and

Figure 5 shows a diagrammatic illustration of another example of the design of the clamping of the adjusting member on the operating side.

The gripper cylinder 2, mounted in the machine frame 1, is firmly connected by means of screws 3 to a fixed gear 4 on the drive side outside the machine frame, which fixed gear has a pin projection on which a crown-like adjusting gear 5 is arranged so as to be adjustable in the angle of rotation. For the non-positive clamping coupling of the two gears 4 and 5, a support plate 7 is attached to the end face of the pin projection of the fixed gear 4 by means of screws 6, against which support plate a plurality of radially directed pressure levers 8 are supported, which are evenly distributed on the circumference and whose one end acts against an annular surface 9 on the adjusting gear 5, and whose other end rests against a disc 10 which acts as a spring-loaded pressure member, the pressure levers 8 being supported on their backs against the support plate 7 with cams 11 arranged near to the outer ends of the pressure levers 8. The disc 10 is guided axially movably on a pressure rod 12 which, in turn, is guided axially movably in the gripper cylinder 2 so as to be movable parallel to its axis and has a radial flange 13 against which a spring 14 is supported, which, at the other end, acts against the disc 10. The example shows a spring 14 consisting of plate springs arranged in alternate directions, which are arranged with prestress and load the pressure levers 8 at the inner ends and thus at the end of the long lever arms. The pin 15 drawn in Figure 1 engages with its ends in bores, on the one hand, on the radial flange 13 and, on the other hand, in the gripper cylinder 2, such that the pressure rod 12 is secured against rotation.

Acting against the disc 10 on the side opposite

the spring 14 is a pressure ring 16 with an integrated rolling bearing 17, through which pressure ring the pressure rod 12 passes and against whose other end a threaded sleeve 18 is movable, which can be screwed onto a thread of the pressure rod 12 and can be screwed by an actuating mechanism, for example by a hexagon head 19. Play 20 between the threaded sleeve 18 and the pressure ring 16 allows the clamping coupling between the fixed gear 4 and the adjusting gear 5 to be released only when an electric fuse protection has been actuated, such that only then, by movement of the threaded sleeve 18, can forces become active on the pressure ring 16 to reduce the reaction force exerted by the prestress of the spring 14 on the pressure levers 8. Within the clearance, the threaded sleeve actuates a switch 21 via a double lever 23 which is mounted fixedly on the machine at 22 and engages with one end in an annular groove on the circumference of the threaded sleeve 18, and whose other end acts on the actuating mechanism of the switch 21. This lever end extends between a stop 25 and a spring 26. The spring 26 ensures the return of the double lever 23 into the stop position in which the switch 21 releases the current circuit of the machine when the clamping of the gears 4 and 5 has taken place. When the threaded sleeve 18 is screwed towards the right in the range of play 20, consequently the switch 21 is firstly actuated to interrupt the current circuit for driving the machine before the pressure ring 16 is displaced axially against the disc 10 to reduce the effect of the reaction force of the spring 14 on the ends of the pressure levers 8. To limit this movement, the pressure ring 16 is arranged on a step of the pressure rod 12 which has a smaller diameter relative to the part which passes through the spring 14, such that a stepped stop is formed for the movement of the pressure ring 16.

The other end of the pressure rod acts against a pressure lever 27 of angular construction which is movable about a bearing bolt 29, arranged transversely to the longitudinal axis of the gripper cylinder, in the

gripper cylinder in the region of the adjusting member 28 which is axially movable relative to the latter. With the other arm, this pressure lever 27 engages below a clamping bar 30 whose ends are connected in each case by a tension bolt 31 and 32 to clamping pieces 54 and 55 which are arranged in cutouts in the adjusting member 28 and act via washers 33 and 34 against the ends of the clamping bar 30. The tension bolts 31 and 32 engage with a collar head behind the clamping bar 30 and are guided through bores in the clamping bar 30 and the adjusting member 28. The pressure rod 12 transmits the reaction force of the spring 14 via the pressure lever 27 to the clamping bar 30, such that the reaction force acts via the tension bolts 31 and 32 as a clamping force on the clamping pieces 54 and 55 and presses the adjusting member 28 against seat surfaces which are formed on the circumference of the gripper cylinder 2. Due to a rounded construction of the contact faces of the pressure lever 27 and the clamping bar 30, even clamping forces are achieved on both clamping pieces 54 and 55, it being possible for the contact faces to be formed from a wear-resistant material, if appropriate by pressure discs. The clamping pieces 54 and 55 can be screwed onto the free ends of the tension bolts 31 and 32, such that an adjustment of the clamping forces and of a play 35 between the pressure rod 12 and the transmission members is possible and the adjusting member 28 can be adjusted axially when the spring 14 is compressed to reduce the reaction forces from the prestress of the spring acting on the pressure levers 8, the pressure rod 12 being displaced towards the left in the drawing until the pressure ring 16 contacts the stop shoulder of the pressure rod 12.

Since the axially movable adjusting member 28 for the gripper changeover is constructed as a slide which extends over the width of the machine and is guided in a cutout in the gripper cylinder 2 on guide strips 38 and 39, which are adjustable by screws 36 and 37, both on the drive side and on the operating side, clamping of the adjusting member 28 is also intended to take place at

least at two places, preferably on the drive side and on the operating side. To achieve this aim, the bearing bolt 29 of the angular pressure lever 27 is designed as a roller bolt and is mounted so as to be movable in the gripper cylinder 2 axially relative to its longitudinal axis. Additionally, the roller bolt 29 is coupled with rotary movement to a pressure member 57 which is axially displaceable in the gripper cylinder 2 and acts on a further pressure lever 58 which is mounted on the operating side in the gripper cylinder 2 so as to be movable about a fixed transverse axis on a hinge pin 59. This pressure lever 58 also has an abutment for the facing end of the pressure member 57 and, offset at an angle thereto, a bearing for clamping pieces 60, 61 which is [sic] guided so as to be radially movable on the operating side radially relative to the longitudinal axis of the gripper cylinder 2 in the adjusting member 28 and, in accordance with the construction on the drive side, is [sic] connected by tension bolts 62 and 63 to a clamping bar 64 which is supported by the bearing of the pressure lever 58 arranged offset at an angle. The pressure member 57 is constructed in a fork shape on the drive-side end, such that it partially surrounds the pressure lever 27 with this fork construction. Arranged in the free ends of the limbs of the fork are bearing lugs for bearing the ends of the roller bolt 29. The constructional design emerges from the illustration in Figure 2. To support the roller bolt 29, roller plates 65 and 66 of a hardenable material are attached on both sides next to the pressure lever 27 in the gripper cylinder 2, along which roller plates the roller bolt can roll in the direction of the longitudinal axis of the gripper cylinder 2.

The reaction forces of the spring 14 bringing about the clamping of the axial adjusting member 28 are transmitted by the pressure rod, on the one hand, to the pressure lever 27 and by the latter to the clamping pieces 54 and 55 provided on the drive side and, at the same time, via the roller bolt 29 and the pressure member 57 of forked construction to the pressure lever 58 and

thus also to the clamping pieces 60 and 61 on the operating side, the roller bolt rolling along the roller plates 65 and 66 to a minimum extent in analogy to the adjustment paths.

5 Serving for the axial adjustment of the adjusting member 28 for the gripper changeover control is the eccentric mechanism consisting of the eccentric bolt 40 and an eccentric pin 41 which engages in a bearing 56 of the adjusting member 28. The adjustment of the eccentric
10 bolt 40 takes place in the example via an angular gear consisting of bevel gears 42 and 43 and a control shaft 44 which is mounted so as to be rotatable in the gripper cylinder 2. The outer end of the control shaft is led through the support plate 7 towards the outside and has
15 an actuating mechanism, for example a hexagon head 45, for a socket spanner 46. The actuation of this hexagon head 45 can be integrated in the electric fuse protection in a manner which is known per se.

 Differing from the previously explained exemplary
20 embodiment, a variant is illustrated in Figure 5, in which one or more clamping pieces 60, 61 which are movable radially relative to the longitudinal axis of the gripper cylinder 2 are connected on the operating side via tension bolts 62, 63 to a clamping bar 69 which has
25 a wedge surface 67 which lies at an angle to the direction of movement of the pressure member 57 and interacts with a wedge surface 68 which is formed directly on the pressure member 57.

List of reference numerals

	1	Frame
	2	Gripper cylinder
	3	Screw
5	4	Fixed gear
	5	Adjusting gear
	6	Screw
	7	Support plate
	8	Pressure lever
10	9	Annular surface
	10	Disc
	11	Cam
	12	Pressure rod
	13	Radial flange
15	14	Spring
	15	Pin
	16	Pressure ring
	17	Rolling bearing
	18	Threaded sleeve
20	19	Hexagon head
	20	Play
	21	Switch
	22	Bearing
	23	Double lever
25	24	Annular groove
	25	Stop
	26	Spring
	27	Pressure lever
	28	Adjusting member
30	29	Bearing bolt
	30	Clamping bar
	31	Tension bolt
	32	Tension bolt
	33	Washer
35	34	Washer
	35	Play
	36	Screw
	37	Screw

	38	Guide strip
	39	Guide strip
	40	Eccentric bolt
	41	Eccentric pin
5	42	Bevel gear
	43	Bevel gear
	44	Control shaft
	45	Hexagon head
	46	Socket spanner
10	54	Clamping piece
	55	Clamping piece
	56	Bearing
	57	Pressure member
	58	Pressure lever
15	59	Hinge pin
	60	Clamping piece
	61	Clamping piece
	62	Tension bolt
	63	Tension bolt
20	64	Clamping bar
	65	Roller plate
	66	Roller plate
	67	Wedge surface
	68	Wedge surface
25	69	Clamping bar



Patent claims

1. Clamping device for an axially displaceable actuator for gripper changeover control on a gripper cylinder of a turning apparatus in a sheet-fed rotary printing machine, in which device a pressure rod, which is loaded by the reaction force of a prestressed spring in the clamping direction and is guided axially movably in the gripper cylinder, fixedly braces clamping pieces, which are movably guided in the actuator, which is axially displaceable on the gripper cylinder, radially relative to the gripper cylinder, radially against the gripper cylinder via intermediate members with the reaction force of the spring, and the pressure rod interacts with an electrically protected adjusting mechanism to reduce the spring tension, characterized in that the pressure rod (12) transmits the reaction force of the spring (14) via further intermediate members onto clamping pieces (54, 55 and 60, 61) which are arranged on both sides in the vicinity of the ends of the adjusting member (28) and are movable radially relative to the gripper cylinder (2).
2. Clamping device according to Claim 1, having an intermediate member consisting of a two-armed pressure lever which is mounted in the gripper cylinder so as to be movable about a bearing bolt, arranged transversely to its longitudinal axis, one arm of which pressure lever forms an abutment for the pressure rod and the other arm of which pressure lever has a bearing, which is movable radially in the gripper cylinder, for clamping pieces which are movable on the drive side in the adjusting member radially relative to the longitudinal axis of the gripper cylinder, characterized in that the bearing bolt (29) of the pressure lever (27) is designed as a roller bolt and is movable in the gripper cylinder (2) axially relative to its longitudinal axis and is coupled with rotary movement to a pressure member (57) which is axially displaceable in the gripper cylinder (2) and acts on a further pressure lever (58) which is mounted on the operating side in the gripper cylinder (2) so as to be

movable about a hinge pin (59) with a fixed transverse axis, has an abutment for the pressure member (57) and, offset at an angle thereto, a bearing for clamping pieces (60, 61) which are guided on the operating side radially relative to the longitudinal axis of the gripper cylinder (2) in the adjusting member.

3. Clamping device according to Claims 1 and 2, characterized in that the pressure member (57) is constructed in a fork shape on the drive-side end, partially surrounds the two-armed pressure lever (27) with the fork construction, and has bearing lugs for the ends of the roller bolt (29).

4. Clamping device according to Claim 2, characterized in that the roller bolt (29) is supported in the gripper cylinder (2) on roller plates (65, 66) which are attached to the gripper cylinder (2).

5. Clamping device according to Claim 2, characterized in that the clamping pieces (60, 61), which are movable radially relative to the longitudinal axis of the gripper cylinder (2), are connected on the operating side via tension bolts (62, 63) to a clamping bar (69) which has a wedge surface (67) which lies at an angle to the direction of movement of the pressure member (57) and interacts with a wedge surface (68) on the pressure member (57).

