

Description

The invention relates to a sheet-guiding drum for printing machines for single-sided printing or printing and perfecting, having the features according to the precharacterizing clause of Patent Claim 1.

Sheet-guiding drums of this generic type are known from JP-A-62-248643. According to this, it is arranged as a storing drum ahead of a turning drum for the turning of the rear sheet edges and has on the outer circumference segments which form outer drum parts and are equipped with suction devices for guiding and smoothing the sheet bearing against the sheet-guiding surface. The suction devices must be set in their position with respect to gripper devices for sheet transport to the format of the sheets to be printed. This setting is performed independently of the adjustment of the gripper devices from single-sided printing to printing and perfecting and is to be capable of being carried out simply, but with great accuracy. For this purpose, the segments forming the actual drum are supported on an inner shaft, are adjustable in the circumferential direction with respect to this shaft and can be locked with this shaft in the set position by means of a clamping device. The publication describes a clamping device in which the two ends of the segments forming outer drum parts have radially inwardly directed side parts, which are braced against each other by a tension rod, which is arranged in a channel extending centrally through the inner shaft and acts outwardly by means of clamping claws against the side parts, these clamping claws in each case being arranged in a recess extending transversely through the shaft. The tension rod engages with one head end behind the one clamping claw and has at the other end a thread, which can be screwed into an internal thread on the end of the channel in the shaft, this end being supported by means of a sleeve surrounding the tension rod and by means of a spring assembly against the outside of the other clamping claw, so that a turning of the tension rod is performed by an outer-lying

actuating member and consequently a spring tension can be generated for the mutual bracing of the side parts of the segments and a firm connection with the shaft is established by means of the clamping claws. The bracing of the side parts easily leads to bending of the segments and the suction device mounted therein, so that the sheet-guiding surfaces of the segments and the suction device undergo a bulging, thereby impairing the perfecting. In addition, the accommodation of the parts of the clamping device in the central channel and the continuous recesses extending transversely thereto leads to a reduction in the stability of the sheet-guiding drum. The clamping forces in this case correspond directly to the spring tension in the spring assembly, which has to be of a correspondingly strong design, as a result of which great operating forces have to be exerted on the actuating member. In the case of the known arrangement, the gear wheel intended for driving the sheet-guiding drum is screwed together with the parts of the clamping device on the end face of the shaft, so that a changing of this gear wheel requires removal of the clamping device. The clamping device is very complex and has no means of ensuring the clamping when the machine is running.

Sheet-guiding drums in which, instead of an inner shaft, a drum body with cast-on journal for mounting the drum is provided, are likewise known.

German Offenlegungsschrift 3,410,689 discloses a clamping device for the same purpose, in which there is rotatably mounted in an inner shaft of a hollow design of a storing drum an integral second hollow shaft, which has on the circumference clamping curve formations, which interact with clamping elements which are supported between the clamping curves and the segments forming the actual drum, for example the carrying elements of the suction device. Inside the second hollow shaft there is provided a third shaft as an adjusting shaft, which is connected at one end to an actuating member and carries at the other end a gear wheel for the swivel drive of the sheet-smoothing device. Three clamping elements are

arranged evenly distributed over the circumference in
recesses of the first, hollow-designed shaft and can be
pressed with an adapted contour against the inner circum-
ference of a spreading sleeve, slit in the longitudinal
5 direction, and consequently from inside radially outwards
against the carrying elements, the second hollow shaft
being turned with respect to the first hollow shaft, so
that the clamping elements run with rollers onto the
curves provided on the circumference of the second hollow
10 shaft. Due to the hollow shaft design, the stability of
the sheet-guiding drum is considerably reduced. The
tensioning forces of the clamping device act radially
outwards, so that the segments of the outer drum are
spread out, as a result of which the components of the
15 smoothing device mounted herein in the central drum
region are displaced outwards, so that duplicating
effects occur during perfecting. The clamping forces are
dependent on the operating forces, so that high clamping
forces also require high operating forces. This known
20 design is also very cost-intensive, difficult to install
and has no electrical protection device.

The axially displaceable mounting of a rod in a
hollow shaft is also known from German Offenlegungs-
schrift 2,708,478 and serves there for changing over the
25 turning device of a turning drum from single-sided
printing to printing and perfecting.

The object of the invention is to design a sheet-
guiding drum of the generic type mentioned at the begin-
ning with a clamping device comprising as few, simple
30 components as possible which is effective without bracing
the surfaces guiding the sheets and the elements possibly
carrying smoothing devices with great frictional forces
which are independent of the operating forces, and the
components of which can be accommodated without any
35 appreciable weakening of the inner shaft having the
bearing journals.

For achieving this object, the invention
envisages a design having features according to the
characterizing clause of Patent Claim 1.

In the case of such a clamping device, only one side cheek, or some other approximately radially extending component of the adjustable drum part, is clamped in, so that no axial and also no radial deformation can occur. The arrangement of a plurality of friction elements which lamellarly interengage alternately leads to a considerable increase in the friction forces with given clamping forces and consequently leads to a correspondingly reliable connection of the parts by friction contact. This permits the introduction of the clamping forces independently of the operating forces by a relatively weakly designed spring assembly, the spring tension of which is transferred by the clamping lever, supported as a rocker or rocking lever, with corresponding leverage to one of the two counter-bearings which clamp between them the overlapping region of the interengaging friction elements.

Due to this leverage in combination with the increase in the number of friction surfaces, the operating forces are further reduced, so that a spring assembly adjusted to this can easily be compressed by an actuating member able to be screwed manually on the tension rod, in order to release the clamping. The very easy manual actuation consequently represents a particular advantage of the features of the invention.

Accordingly, the tension rod for transferring the spring force of the spring assembly introducing the clamping forces can also be of a thin design, so that it can be accommodated in a bore of relatively small cross-section and the shaft or the journal of the shaft is not markedly weakened as a result. The accommodation of the clamping lever, advantageously produced from a high-strength material, in a lateral recess of the shaft or of the cast-on journal also does not lead to any appreciable weakening of this shaft or of the journal, because the recess can be kept relatively small in cross-section and, moreover, does not have to be made continuous.

According to a further idea for developing the invention, the end of the tension rod, led out from the

shaft or the journal at the end face, and the spring introducing the clamping forces are arranged in a housing bell, in which the spring is supported on the one hand against this housing bell and on the other hand against
5 a widening on the tension rod, for example against a flange of the tension rod. The free end of the tension rod engages through the housing bell in an axially moveable manner and has a thread, onto which a corresponding internal thread of an actuating member can be
10 screwed on a first section, which corresponds to an idle path, and on a second section, in the case of which the actuating member bears against the housing bell and, upon further turning, axially displaces the tension rod against the action of the spring. The idle path of the
15 actuating member can be used in the way known per se for actuating the switching elements of an electrical protection device. As a result, it is possible in the case of sheet-guiding drums of the type mentioned at the beginning to provide an electrical protection device for the
20 closed clamping in the operating state of the machine.

In an advantageous further development, the invention provides that the end positions for the movement of the actuating member are limited by stops, which at the same time define the idle path for the switching
25 of the electrical protection device, the tension rod displacing a stop limiting the turning of the actuating member upon releasing of the clamping device at the end of the axial movement of the said tension rod into its operative position. In this case, it is expedient to
30 design the axial overlapping of the radially effective stops in the stop positions to be smaller than the pitch of the thread with which the actuating member is moveable on the tension rod. It is achieved by such a design that the idle path of the actuating member can correspond to
35 a plurality of revolutions. Further developments of these elements of the electrical protection device are included in the Subclaims 10 and 11.

: Finally, the design according to the invention leads to the advantage that the housing bell with the

tension rod spring-biased therein in the clamping direction, the actuating member, its stop limitations and with switching elements of the electrical protection device can be designed as a preassembled structural unit and can be fastened by means of screws on the end face of the shaft. In this context it is also worth mentioning that the means for actuating the clamping device and the means for electrical protection of this clamping device are arranged separately from the drive gear wheel and consequently cannot be obstructive if work has to be carried out, such as for example installations, removals or settings of the drive gear wheel.

In the case of a sheet-guiding drum with a clamping device which has the design mentioned above with friction elements and their actuation by means of a rocker and an introduction of clamping force independent of the operating forces by means of a spring assembly, an arrangement of these features on one side is adequate. If appropriate, however, such an arrangement can also be provided on both sides, with means effective independently of one another.

An exemplary embodiment of the features of the invention is represented in the drawing, in which:

Figure 1 shows a section in a plane of the drum axis through the end of a sheet-guiding drum and its mounting,

Figure 2 shows a side view of the arrangement in Figure 1,

Figure 3 shows a sectional representation, on an enlarged scale in comparison with Figure 1, through the operating device in the sectional plane of Figure 1, with the clamping device in the closed position,

Figure 4 shows the same sectional representation as Figure 3, but with the clamping device in the open position, and

Figure 5 shows a section according to the line V - V in Figure 4.

The sheet-guiding drum according to the exemplary embodiment has an inner shaft 1 of solid material and an

outer drum having at least one segment 2 which can be adjusted in the circumferential direction with respect to the inner shaft 1. Instead of such a shaft, the sheet-guiding drum may also have a drum body with cast-on
5 journals for the mounting of the drum, so that the design described below is provided in such a journal.

A sheet-bearing surface is formed on the lateral surface of the segment. It may, furthermore, be provided with suction nozzles or other devices for sheet smoothing
10 or for gripping sheets. This segment 2 is able to be locked firmly with the inner shaft 1 by a clamping device. The inner shaft 1 is mounted at both ends in the side walls 4 of the machine frame by bearing journals 3, which are formed integrally with the shaft of solid
15 material, and the said shaft can be driven by a gear wheel 5, which is connected outside the machine frame to the end face of the shaft 1 by means of a plurality of distributedly arranged screws 6. For a secure, frictional locking of the shaft 1 and of the segment 2 arranged in
20 the outer drum, a plurality of friction elements 7 are fastened, for example by means of screws 9, in stack form with a distance from one another in the manner of a multiple disk clutch on a surface 8 of the segment 2 extending radially, as close as possible to the side wall
25 4. A stack of friction elements 10 of a complementary design is fastened, for example by means of screws 12, on a likewise radially extending surface of a counter-bearing 11, connected to the bearing journal 3 or directly to the shaft 1, the friction elements 7, lami-
30 nated with intermediate layers of the same thickness, and the friction elements 10, likewise laminated with such intermediate layers, interengaging and overlapping in a certain region. In this overlapping region 13, the friction elements 7 fastened on the segment 2 and the
35 friction elements 10 fastened on the counter-bearing 11 can be braced axially against each other between the counter-bearing 11 and a second counter-bearing 14 on the shaft 1, so that due to the increase in the number of friction surfaces between the friction elements 7 and 10

high frictional forces are produced even with relatively low clamping force for bracing. The example shows in each case three friction elements in a stack, so that seven friction surfaces are produced in the overlapping region 13. In adaptation to the shape of the segment 2, the friction elements 7 and 10 are also of a segment-shaped design, so that they extend in side view only over part of the circumference, as can be seen from Figure 2. In the example, the counter-bearing 11 is formed by an annular segment, which is fastened by means of screws 15 on the bearing journal 3 of the shaft 1 and is axially supported additionally against a supporting ring 16 or the like.

The clamping device has a clamping lever 17, which is arranged in a lateral recess 18 of the shaft 1 and acts herein as a rocker having lever arms of unequal length. This clamping lever 17 is supported in the vicinity of its outer end against the counter-bearing 14 and presses with a pressure block 19 in the overlapping region 13 against the inner side, lying opposite the surface 8, of the radial part of the segment 2, so that the pressure forces act parallel to the longitudinal axis 20 of the shaft 1. In the direction of the shaft axis 20, there presses against the other end of the clamping lever 17 the end face of a tension rod 21, which is permanently spring-biased in the clamping direction. This tension rod 21 is arranged centrally or eccentrically in a recess 22, arranged parallel to the shaft axis 20, and is led out by the opposite end at the end face from the bearing journal 3 of the shaft 1. Outside the bearing journal 3, the tension rod 21 has an annular flange 23, which is passed through at at least one point by a screw 24, which secures the tension rod 21 against turning without obstructing its axial displaceability. Arranged outside the radial flange 23, is a spring assembly 25, for example comprising cup springs, which is supported on the one hand against the radial flange 23 and on the other hand against the inside of a housing bell 26, which is firmly connected by the screw 24 and further screws, not

shown in the drawing, to the end face of the bearing journal 3. For this purpose, the gear wheel 5 has a central recess, which permits the passing through of the housing bell 26. Due to the spring 25, the tension rod 21 is constantly pressed against the inner end of the clamping lever 17, so that by means of this clamping lever 17 the spring forces are multiplied and transferred to the friction surfaces of the friction elements 7 and 10. Consequently, the clamping force between the friction elements is dependent exclusively on the spring force of the spring 25 and not on operating forces. The free end of the tension rod 21 is led outwards through the bottom of the housing bell 26 and is connected here to an actuating member 27. The example shows a thread on the outer end of the tension rod 21, onto which there can be screwed an internal thread of the actuating member, which interacts with a device for the electrical protection of the clamping device. For this purpose, the screwing of the actuating member 27 on the thread of the tension rod 21, starting from the clamping position, takes place initially on an idle path, which is intended for the actuation of the electrical protection device. Shown by way of example is a switching member 28, which is mounted fixedly on the machine as a tilting lever and engages by one end in a circumferential recess 29 on the actuating member, whereas the other end acts against an electrical switch 30, a spring 31 biasing the switching member 28 in the direction of the initial position before its movement. Only after the idle path does the actuating member 27 come to bear against a rolling-contact thrust bearing 36 on the outside of the housing bell 26, so that, upon further screwing, the tension rod 21 is displaced axially to the left in the plane of the drawing. As a result, the clamping lever 17 is released, so that the frictional connection between the friction elements 7 and 10 is discontinued. Upon turning the actuating member 27 in the opposite direction, the spring 25 initially presses the tension rod 21 with the force of the spring 25 against the inner end of the clamping lever 17, so that the

frictional connection between the friction elements 9 [sic] and 10 is restored, before the actuating member 27 can be turned back on the idle path into the initial position, it again releasing the switch 30 for the electrical protection of the clamping device, by means of the switching member 28.

According to an idea of the invention, independent in itself, the end positions for the movement of the actuating member 27 are limited by stops 32 or 33a and 33b, which are designed such that they at the same time define the idle path for the switching of the electrical protection device. For this purpose, it is provided that the tension rod 21 displaces the stop 33b limiting the turning upon releasing of the clamping device at the end of the axial movement of the said tension rod into its operative position. In addition, the axial overlapping of the radially effective stop 32 with the stops 33a or 33b in the stop positions is smaller than the pitch of the thread on the free end of the tension rod 21 or in the actuating member 27. Provided are a stop 32 comprising a cam on the actuating member 27, this cam having two stop surfaces, of which one is effective in each direction of rotation, and counter-stops 33a and 33b on machine parts which are fixed against rotation, have in the axial direction of the tension rod or of the shaft a distance from each other adjusted to the idle path and are arranged axially displaceably on the outer-lying end of a bolt 34, which is axially moveable in the housing bell 26 and the inner end of which is supported against the radial flange 23 of the tension rod 21. Due to the smaller overlapping of the stop 32 with the stops 33a or 33b in comparison with the thread pitch and due to the axial distance of the two latter stops 33a and 33b from each other, it is achieved that the stop 32 on the actuating member 27 can execute a plurality of revolutions of the actuating member 27 to accomplish an adequately long idle path for the actuation of the electrical protection device and is also rotatable as well, in order to permit an axial displacement of the

tension rod 21 against the action of the spring 25 for releasing the clamping device before the stop 32 comes to bear against the stop 33b in the end position with the clamping device released. For this purpose, the stop 33b
5 is axially displaced slightly by the bolt 34, starting from the axial movement of the tension rod 21, so that the said stop engages in the turning circle of the stop 32. Upon the first revolution of the actuating member 27 in the opposite direction, the tension rod 21 is displaced to the right, so that the stop 33b, supported by
10 the spring 35, also comes to bear to the right against the housing bell 26 and there is no longer anything in the way of the stop 32 upon the next revolution of the actuating member 27. Only once the idle path has been
15 covered does the stop 32 come to bear again against the stop 33a, so that as a result the other end position of the actuating member is limited. Figure 4 shows the stop contact with the clamping device released.

Instead of the actuating member 27 described,
20 which can be turned manually, an actuating member which is moved by motor may also be provided for the tension rod 21.



Patent Claims

1. Sheet-guiding drum for printing machines for either single-sided printing or printing and perfecting, in which at least two sheet-guiding surfaces (8) are
5 provided on the circumference of segments of an outer drum part, which surfaces are adjustable in the circumferential direction with respect to an inner shaft (1) or a cast-on drum journal and can be locked with this shaft or this journal by a clamping device (7, 10, 17, 25),
10 which has friction surfaces on the segment (2) of the outer drum part and on the shaft or the journal, which surfaces are radially directed and can be pressed axially against one another by a tension rod (21), moveable in the axial direction of the shaft (1) or of the journal,
15 characterized in that the friction surfaces are formed on lamellarly interengaging friction elements (7, 10), alternately connected to a segment of the drum or to the shaft or the journal in a rotationally fixed manner, and can be clamped by means of a moveable clamping lever
20 (17), arranged transversely to the axial direction of the clamping force, between two counter-bearings (11, 14) supported on the inner shaft or the journal, the clamping lever (17) acting as a rocker and its one end being biased by means of spring force (25) in the clamping
25 direction by means of the tension rod (21) secured against turning.

2. Sheet-guiding drum according to Claim 1, characterized in that the clamping lever (17) is arranged in a lateral recess (18) of the shaft (1) and the tension rod
30 (21) is arranged in a bore (22), which extends from the end face in the direction of the shaft axis (20) to the recess (18).

3. Sheet-guiding drum according to Claim 2, characterized in that, in the overlapping region (13) of the
35 friction elements (7, 10), the clamping lever (17), fitted loosely in the recess (18), acts with its outwardly pointing end against the inner side of a flange extending radially inwards on the segment (2) and is supported against a counter-bearing (14) in the bounding



wall of the recess (18) of the shaft (1) by a comparatively smaller radius on the side lying opposite the friction surfaces of the friction elements (7, 10).

4. Sheet-guiding drum according to Claim 3, characterized in that the supporting surfaces for the clamping lever (17) are formed by inserts of hardened material.

5. Sheet-guiding drum according to Claim 3, characterized in that on the one hand a plurality of friction elements (7) and intermediate layers of lesser thickness are fastened on an end face (8) of the segment (2) extending radially to the shaft axis (20) and on the other hand a plurality of friction elements (10), complementary thereto, are fastened on a surface of the shaft (1) extending radially to the shaft axis (20), the overlapping region (13) of the interengaging friction elements (7, 10) lying in the force flux of the two counter-bearings for the clamping force.

6. Sheet-guiding drum according to Claim 1, characterized in that the tension rod (21) can be retracted against the action of the spring (25), biasing the said rod in the clamping direction, by means of an actuating member (27) which is arranged at the end face of the shaft (1), is equipped with an electrical protection device (30) and, for the purpose of switching this protection device, can be coupled with the tension rod (21) for the displacement of the latter in the axial direction only after an axially effective idle path.

7. Sheet-guiding drum according to Claim 6, characterized in that the spring (25) biasing the tension rod (21) in the clamping direction is supported inside a housing bell (26), fastened on the end face of the shaft (1), on the one hand against this housing bell (26) and on the other hand against the tension rod (21), the free end of which, which is led outwards through the housing bell (26) in an axially moveable manner, has a thread onto which a corresponding internal thread of the actuating member (27) can be screwed on a first section, corresponding to the idle path, and an adjoining second section, in the case of which the actuating member (27)



is supported against the housing bell (26), for the axial displacement of the tension rod (21).

8. Sheet-guiding drum according to Claim 7, characterized in that the end positions for the movement of the actuating member (27) are limited by stops (32 and 33a, 33b), which at the same time define the idle path for the switching of an electrical protection device (30), the tension rod (21) displacing a stop (33b) limiting the turning of the actuating member (27) upon releasing of the clamping device at the end of the axial movement of the said tension rod into its operative position.

9. Sheet-guiding drum according to Claim 8, characterized in that the axial overlapping of the radially effective stops (32 and 33a, 33b) in the stop positions is smaller than the pitch of the thread with which the actuating member (27) can be screwed onto the tension rod (21).

10. Sheet-guiding drum according to Claim [sic] 8 and 9, characterized in that the stops (32 and 33a, 33b) comprise a cam on the actuating member (27) and two rotationally fixed cams, which have in the displacement direction of the tension rod (21) a distance from each other adjusted to the idle path and are arranged axially displaceably.

11. Sheet-guiding drum according to Claim 10, characterized in that the two axially displaceable cams which form the stops (33a, 33b) are fastened on the outer end of a bolt (34) which is guided in the housing bell (26) and the inner end of which is axially supported against the tension rod (21) under the action of a spring (35).

12. Sheet-guiding drum according to Claim 11, characterized in that the housing bell (26) is designed with the tension rod (21) spring-biased therein in the clamping direction, the actuating member (27), its stop limitation and with the switching elements (28) of the electrical protection device (30) as a preassemblable structural unit and can be fastened by means of screws (24) on the end face of the shaft (1).

13. Sheet-guiding drum according to one or more of



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the preceding Claims 1 to 12, characterized in that a nut which can be screwed manually on the thread of the tension rod (21) is provided as the actuating member (27).