

PATENT SPECIFICATION (11)

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(54) A SHEET-FED ROTARY PRINTING MACHINE

(71) We, HEIDELBERGER DRUCK-
 MASCHINEN AKTIENGESSELLSCHAFT, a body
 corporate organised and existing under the
 laws of the Federal Republic of Germany, of
 5 69 Heidelberg, Alte Eppelheimer Strasse
 15—21, Federal Republic of Germany, do
 hereby declare the invention, for which we
 pray that a patent may be granted to us, and
 the method by which it is to be performed,
 10 to be particularly described in and by the
 following statement:—

The invention relates to sheet-feed rotary
 printing machines including a guide drum, for
 receiving sheets from a first impression cylin-
 15 der, a turning drum for feeding sheets to a
 second impression cylinder, a storage drum
 for transferring sheets from the guide drum
 to the turning drum and an adjusting mecha-
 nism for converting the machine between
 20 first- and perfection-printing.

Adjusting mechanisms of this type are
 needed on all convertible perfection printing
 machines. In perfection printing, the sheet
 to be printed is passed from the guiding drum
 25 to the storage drum which normally has a
 diameter twice as large as that of the guide
 and turning cylinders, and is then lead by its
 front edge past the common tangential point
 of the storage drum and the turning drum.
 30 As soon as the rear edge of the sheet reaches
 the common tangential point, it is grasped
 by the gripper mechanism of the turning
 drum. At the same time the front edge of
 the sheet is released by the gripper mecha-
 35 nism of the storage drum, and the sheet is
 passed over, rear edge first, to the next im-
 pression cylinder. In first-printing however,
 the sheet is simply passed by its leading edge
 from the guide drum in turn to the storage
 40 drum and the turning drum.

Previous mechanisms for converting the
 machine between first- and perfection-printing
 (as, for example, disclosed in German Patent
 Publications Nos. 1,107,246, 1,611,241,
 45 2,126,258, 2,228,671 and 2,227,151) have
 been of complicated design, have not been
 readily accessible to the operator, and have
 therefore given rise to operating difficulties.
 Several adjustments have usually had to be

carried out at various points on the machine 50
 by way of separate adjusting devices. These
 devices have usually included separate scales
 indicating the extents of the adjustments at
 the various points in the machine, and each 55
 of these scales was capable of introducing
 a separate inaccuracy into the setting of the
 printing machine. Depending on the number
 of separate adjusting devices, these inaccur-
 acies could accumulate and could have an
 adverse effect on printing quality, or even 60
 result in damage to the machine. Thus, for
 example in the case of perfection printing,
 inaccuracies in the register, could be in-
 troduced, necessitating further adjustment
 of the machine. Moreover, the conversion 65
 of the machine is often further complicated
 by the necessity of using a large number of
 different tools.

Accurate adjustment of the printing ma-
 chine during changeover can therefore often 70
 be a very time-consuming operation, de-
 manding a very high standard of responsi-
 bility on the part of the machine operator. The
 productivity of the press is therefore reduced
 considerably and there is always a risk that 75
 the adjustments to the machine may be
 faulty, which reduces the operating reliability
 of the machine.

According to the present invention, there
 is provided a sheet-fed rotary printing ma- 80
 chine including a guide drum for receiving
 sheets from a first impression cylinder, a
 turning drum for feeding sheets to a second
 impression cylinder, a storage drum for trans-
 85 ferring sheets from the guide drum to the
 turning drum, the said storage drum being
 adjustable to carry sheets of different for-
 mate and including sheet grippers which are
 operated by an adjustable cam, and an ad-
 justing mechanism comprising an adjusting 90
 shaft carrying first and second adjusting
 wheels, the said shaft being moveable be-
 tween a first shift position, in which the first
 adjusting wheel is in driving engagement with 95
 a mechanism for adjusting the relative dis-
 position of the drums, whereby the ma-
 chine can be converted between first- and
 perfection-printing, and a second shift posi-

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tion in which the first adjusting wheel is in driving engagement with a mechanism for effecting adjustment of the storage drum to accommodate sheets of different formats and in which the second adjusting wheel is in driving engagement with a mechanism for adjusting the position of the cam.

Preferably, the cam causes displacements of a cam follower which are small compared with the radius of the storage drum and which occur along a path which is inclined at a shallow gradient to the peripheral surface of the drum. The result of this is that, as the cam follower meets and leaves the surface of the cam, the inertia forces are kept small and the movement of the sheet support means is kept to a minimum, thus greatly diminishing wear.

Advantageously, the adjusting shaft is moveable from a neutral position into the first and second shaft positions, and, desirably, one or more safety devices are provided for preventing accidental movement of the adjusting shaft into the first and second positions. These safety devices preferably protect all the adjustment operations so that the chances of a machine operator making a faulty adjustment are substantially reduced, thereby facilitating operation of the machine. Preferably, the second adjusting wheel is fixed adjacent the end of the adjusting shaft on the inside of a side wall, of the machine, and the mechanism for adjusting the cam comprises an adjusting member mounted for rotation about the axis of the storage drum, engagable with the second adjusting wheel and carrying the cam, and means is provided for fixing the adjusting member relative to the side wall of the machine, for example by clamping directly to the inside of the side wall.

Desirably, in order to give greater ease of operation and faster change of system on the machine, as well as to increase accuracy during shifts, the relative dispositions of the drums and the relative disposition of the sheet support means and the storage drum are indicated on a common scale device on a drive wheel of the machine, the said scale device including two relatively moveable parts and means for securing the two parts together. This permits accurate setting and reading of changeover values as quickly as possible so that the time taken by the changeover operation can be substantially reduced.

In order that the invention may be better understood, a preferred embodiment thereof will now be described by way of example only, with reference to the accompanying drawings in which:—

Figure 1 is a partly-schematic front elevation of a printing machine in accordance with the invention showing its guide drum, storage drum and turning drum arranged for first printing of large sheets;

Figure 2 is an elevation similar to Figure 1 but showing the drums arranged for perfection printing of large sheets;

Figure 3 is an elevation to Figure 2 but shows the drums arranged for perfection printing of small sheets;

Figure 4 is a partial vertical cross-section of the machine of Figures 1 to 3 showing the guide drum, storage drum and turning drum with their drive gears and adjusting mechanism; the adjusting mechanism being in its second shift positions;

Figure 5 is a front elevation of the drive gear for the turning drum as it appears when the machine is adjusted for perfection printing;

Figure 6 is a cross-section through the drive gear of Figure 5;

Figure 7 is a partial elevation similar to Figure 5 but showing the drive gear as it appears when the machine is adjusted for first-printing;

Figure 8 is a partial cross-section similar to Figure 6 but showing the drive gear in a different configuration;

Figure 9 is a partly-cutaway view showing, on an enlarged scale, the adjusting mechanism of Figure 4 in its first shift position (full lines) and its neutral position (broken lines);

Figure 10 is a partial cross-section on an enlarged scale of a clamping device shown in Figure 4;

Figure 11 is a partial cross-section on an enlarged scale of the storage drum shown in Figure 4.

As can be seen from Figures 1, 2, 3 and 4, there are mounted in side walls 1, 2, in succession in the direction of circulation of the sheet, a guide drum 3 with grippers 4, a storage drum 5 and a turning drum 6 with pincer-type grippers 7. The storage drum comprises of a plurality of fixed front segments 8, which are rigidly connected with a shaft 9 by means of taper pins 10, and of a plurality of rear segments 11 rotatably disposed on the shaft 9.

Screwed on to the front segments 8 is a gripper bridge with grippers 13. Control of the grippers 13 is provided by means of cam rollers 14 which are fixed to a gripper shaft 16 by means of cam levers 15. The outer two of the front segments 8 are provided with set pins 17 on which are disposed clamping parts 18 which can be fixed by means of clamping nuts 19. Screwed to the rear segments 11 is a sucker bar 20 and, to the two outer segments, a flange 21 and a pin 22 (Fig. 4, 11). The sucker bar 20 is connected through a connecting tube 23 to a valve disc 24 which is fastened by means of screws to the flange 21 facing the side wall 2 and thus is connected rigidly to the rear segments 11. Disposed between the valve disc 24 and the side wall 2 is a disc cam 25 for controlling the suction air for holding

the rear edge 26 of the sheet, the disc cam being 25 screwed to the inside of the side wall 2 and connected through a vacuum connection 27 to a vacuum unit (not shown).

5 As shown in Figure 4, a bar 28 is mounted in the side walls 1, 2, behind the turning drum 6 (looking in the direction of movement of the sheet) which bar extends over the whole width of the drum. Between the side walls 1, 2 and the outer two rear segments 11, claws 29 are fixed to the bar 28 and are provided with catch recesses 30 at the ends. Fixed to the inside of the side wall 1 is a spring-loaded actuating lever 31 which is articulated to the bar 28. As can be seen from Figures 2 and 3, a securing pin 32 is disposed beneath a claw 29 and above the claw 29 is a limit switch 34 which is fixed to a support 33. There is also a limit switch 36 located, by means of a support 35, in front of the point of articulation of the spring loaded actuating lever 31.

As shown in Figures 1 and 4, on the bearing bush 37 of the shaft 9 inside the side wall 1 there is a slotted link with two gripper cams 38, 39 by means of which the gripper shaft 16 is controlled. The gripper cam 38 is used for both first and perfection printing, whereas the gripper cam 39 is only used for first printing and is swung out, by means which are not illustrated, during perfection printing.

Fixed to the outside of the left-hand side wall 1 is a bearing 43 in which an adjusting shaft 44 is rotatably mounted (Figure 9). The adjusting shaft 44 has three stop notches 45 and can be slid axially, by means of a crank 46 fixed to the outer end, into a stop position 47 and two shift positions 48 and 49. A ball catch 50 loaded by a compression spring is disposed in a supporting wall of the bearing 43. A first adjusting pinion 51 is fixed to the adjusting shaft 44 to the right of the stop notches 45. About half way between the adjusting pinion 51 and the rear bearing wall there is a ring 52 which is mounted rigidly on the adjusting shaft 44. Provided above the adjusting shaft 44 within the range of axial shift of the ring 52 is a limit switch 54. A magnet with a plunger 56 is fixed to the outside of the side wall 1.

The side wall 1 has a through hole 57 and, on the inside a circular recess 58 through which the adjusting shaft extends. Fixed to the end of the adjusting shaft 44 within the side wall 1 is a second adjusting pinion 59 which, in the shift position 49, is in engagement with an adjusting part 60 which is preferably in the form of an externally toothed segment and rotatably mounted on the bearing bush 37. The adjusting part 60 may also take the form of a toothed adjusting plate, the adjustment being effected by means of a toothed belt. Another possibility for construction consists in making the adjusting

part 60 in the form of an adjusting plate which is provided with chain toothing all around and is adjustable by way of a chain. If a correspondingly smaller range of adjustment is adequate for the required shift then the adjusting plate 60 need only be toothed over a segmental portion of the circumference, a chain being linked on to the two end points of this toothing. Finally, a friction wheel may be provided instead of the adjusting part 60. This, however, presupposes that the second adjusting pinion 59 through which the adjustment is made is provided with a friction facing.

A gripper opening cam 61 for perfection printing is fixed to the toothed segment 60. As is shown in Figure 10, there is disposed in front of the guide drum 3 (seen in the sheet rotation direction), in the side wall 1, a clamping pin and, outside, a clamping screw 63, by means of which the rotatable toothed segment 60 can be clamped tight. Figure 4 shows the drive for the individual drums. Fixed to the shaft end of the guide drum 3, outside the side wall 1, is a driving gear 64 which meshes with the driving gear 65 of the impression cylinder of the first printing unit—not shown—which is mounted in front of it. The driving gear 53 of the storage drum 5 is disposed rigidly on the shouldered end of the shaft 9. On one side it engages with the driving gear 64 and on the other with the gear rim 66.

As shown in Figures 5 and 6, on the shaft end of the turning drum 6 there is fixed, with screws 67, the driving gear 68 which meshes with the driving gear 69 of the impression cylinder—not shown—of the second printing unit. The gear rim 66 is clamped tight on a shoulder of driving gear 68 by means of clamping screws 70 and claws 71. Screwed to its front is also a dial ring 72 with which is associated a mark 73 on a clamping claw 71. There is a bore 74, 75 in the dial ring 72 and gear rim 66 respectively in which is disposed a drop-in pin 77 which is loaded by means of a compression spring 76. In the end face of the shoulder of the driving gear 68 is a fixing hole 78 for first printing and one 79 for perfection printing, respectively. On the smooth side of the driving gear 68 is fixed a pointer 80 with which is associated a zero mark 81 disposed on the outside of the side wall 1.

The manner of operation of the above-described invention is described below, in greater detail.

Drive is by way of the driving gear 65 of the impression cylinder—not shown—of the first printing unit and is transmitted continuously through the double-width driving gear 64, the driving gear 53 as well as through the gear rim 66 and the driving gear 68 on to the driving gear 69 of the im-

pression cylinder—not shown—of the second printing unit.

- 5 To change the machine system over from first printing to perfection printing with maximal format size, the following shift operations have to be performed:

10 The machine must first be brought into the zero position marked on the outside of the side wall 1, by turning it forwards stepwise as follows, fine adjustment being made with the crank 46. Axial shifting of the adjusting shaft 44 into the first shift position 48 (Fig. 9) brings the first adjusting pinion 51 into engagement with the driving gear 53 of the storage drum 5. When the ballcatch 50 has dropped into the stop notch 45 in the adjusting shaft 44 associated with shift position 48, the pointer 80 fixed to the driving gear 68 of the turning drum 6 must be rotated by means of the crank 46 until it is exactly on the zero mark 81.

20 The hold between the gear rim 66 and the driving gear 68 of the turning drum 6 must then be released by slackening the clamping screws 70 of the clamping claws 71, whereby the first printing unit, including the guide drum 3 and the storage drum 5, is disconnected from the rest of the machine. However the driving gear of the storage drum 5 remains in engagement with the gear rim 66 of the driving gear 68 of the turning drum 6, now rotatable as a result of the slackening of the clamping claws 71.

25 The gripper cam 39, which is used for first printing only, can be swung away under the track of the cam rollers 14 by means which are not illustrated.

30 The actual changeover from first printing to perfection printing can now be carried out. For this purpose the drop-in pin 77 of the gear rim 66 must first be lifted out of the hole 78 in the driving gear 68 which fixes the perfection position. The gear rim 66 is then turned with the crank 46 until the drop-in pin 77 snaps into the fixing hole 79 provided for the perfecting process. This change can be read off on the dial ring 7 in conjunction with the marking 73 provided on the clamping claw 71.

35 In the course of this shift, the first printing unit—not shown—together with the guide drum 3 and the storage drum 5—rotates through a definite phase in opposition to the direction of running of the rest of the machine, so that the rear edge 26 of the sheet is in association with the grippers 7 of the turning drum 6. The exact position is fixed, here, by the sprung drop-in pin 77 and the corresponding hole 79 in the driving gear 68 of the turning drum 6 (Figure 1).

40 The following adjustments must be made for the subsequent change of format on the machine in the perfection printing position.

45 First, the rear segments 11 must be secured in the starting position now fixed by

the drop-in pin 77. This is done by manually engaging the stop recesses 30 of the claws 29 fixed to the bar 28 in the pins 22 fixed to the outer two rear segments 11. Axial shifting of the adjusting shaft 44 into the second shift position 49 (Fig. 4) is blocked by the plunger 56 of the magnet 55 under control from the limit switch 36. Only when the claws 29 are fully engaged is the limit switch 36 pressed, by way of the spring-loaded bent lever 31, to remove the blocking by drawing up the magnet plunger 56 and thus allowing access to the second shift position 49.

50 The clamping connection of the flanges 21 of the rear segments 11 to the front segments 8 is then released. To do this the clamping nuts 19 on the adjusting pins 17 have to be slackened. The crank 46 now has to be moved axially into its second shift position 49. By this action the first adjusting pinion 51 is moved into the toothing of the driving gear 53 of the storage drum 5 and the second adjusting pinion 59 comes into engagement with the toothed segment 60. As a result, a connection is established, by way of the first adjusting pinion 51 and the driving gear 53, with the front segments 8, with the grippers 13 and, by way of the second adjusting pinion 59 and the toothed segment 60, with the gripper opening cam 61 for perfection printing.

55 The clamping screw 63 then has to be slackened, thereby releasing the clamping connection of the toothed segment 60 to the side wall 1. As a result the toothed segment 60, with the gripper opening cam 61 fixed to it, becomes freely rotatable once more.

60 Once the drop-in pin 77 has been lifted out of the hole 79 fixing the perfection printing position, adjustment for format can be carried out by means of the crank 46 and the read off on the dial ring 72. In this process, the front segments 8 with the grippers 13 are rotated by way of the driving gear 53 of the storage drum 5 and the toothed segment 60 with the gripper opening cam 61 for perfection printing, in opposition to the running direction, until the required format is reached. Owing to the indirect rigid connection between the valve disc 24 of the air control valve and the rear segments 11 with the sucker bar 20, the change of the moment of control for the suction air is automatically included in the changeover operation.

65 The shifting of the gripper opening cam could thereby also be carried out with the means mentioned in the description, that is to say a toothed belt, a chain, and also a friction wheel.

When this adjustment for format has been completed the flanges 21 on both sides of the rear segments 11 must again be clamped to the front segments 8 by tightening the

clamping nuts 19. Furthermore the gear rim 66 is clamped to the driving gear 68 of the turning drum 6 by the clamping claws 71 by means of the clamping screws 70 and the toothed segment 60 is again secured by the clamping screws 63.

This re-establishes all the connections in the new position of the machine.

Before the lock on the rear segments 11 is released it is necessary to shift the adjusting shaft 44 axially into the shift position 48 by means of the crank 46. The claws 29 fixed to the bar 28 are then lifted out of the lateral pins 22 of the rear sheet-rest segments 11, whereby the limit switch 36 is released and the limit switch 34 pressed. The release of the limit switch 36 operates the magnet plunger 56 in such a way that the second shift position 49 is again blocked for change of format. In the subsequent axial movement of the adjusting shaft 44 into the disconnected stop position 47, the second limit switch 54 which is fitted for protection of the machine is pressed by way of the ring 52 fixed on the adjusting shaft 44 and, together with the limit switch 34, releases the machine for electric operation.

When the unit producing suction air for the sucker bar 2 at the rear edge of the sheet has been switched on, the machine is again ready for operation.

Resetting from perfecting to first printing is carried out in inverse order.

The embodiment of the invention described above provides a trouble-free change which automatically ensures accuracy of alignment, both for first and also for perfection printing, and which is capable of handling sheets within a wide range of format sizes. All the operations involved in changing between first- and perfection-printing are combined and are effected by means of a single adjustment control located outside the machine. This arrangement is particularly convenient because the relative settings of the cylinders and the format size can be set on and read from a common scale. Moreover the risk of damage to the machine is removed because all the shifting operations are protected by safety devices. In comparison with previous machines, the adjusting mechanism is cheap and compact and convenient to operate. Consequently the level of skill and responsibility required in the machine operation is thus kept within acceptable limits and the length of the periods during which the machine is idle are reduced. Furthermore the apparatus does not cause undue wear in the gripper elements.

WHAT WE CLAIM IS:—

1. A sheet-fed rotary printing machine including a guide drum for receiving sheets from a first impression cylinder, a turning drum for feeding sheets to a second im-

pression cylinder, a storage drum for transferring sheets from the guide drum to the turning drum, the said storage drum being adjustable to carry sheets of different formats and including sheet grippers which are operated by an adjustable cam, and an adjusting mechanism comprising an adjusting shaft carrying first and second adjusting wheels, the said shaft being movable between a first shift position, in which the first adjusting wheel is in driving engagement with a mechanism for adjusting the relative dispositions of the drums, whereby the machine can be converted between first- and perfection-printing, and a second shift position in which the first adjusting wheel is in driving engagement with a mechanism for effecting adjustment of the storage drum to accommodate sheets of different formats and in which the second adjusting wheel is in driving engagement with a mechanism for adjusting the position of the cam.

2. A printing machine according to claim 1 wherein the cam causes displacements of a cam follower which are small compared with the radius of the storage drum and which occur along a path which is inclined at a shallow gradient to the peripheral surface of the drum.

3. A printing machine according to claim 1 or claim 2 wherein the adjusting shaft is movable from a neutral position into the first and second shift positions.

4. A printing machine according to claim 3, wherein one or more security devices are provided for preventing accidental movement of the adjusting shaft into the first and second positions.

5. A printing machine according to claim 4, wherein one security device comprises a ring mounted on the adjusting shaft and a limit switch disposed radially outwardly from the adjusting shaft for actuation by the ring upon axial movement of the adjusting shaft from the neutral position into the first position, and another security device comprises an electromagnetically movable stop which prevents movement of the adjusting shaft into the second position.

6. A printing machine according to any one of claims 1 to 5, wherein the adjusting shaft is rotatably mounted in a bearing fixed to a side wall of the machine and may be slid axially from a neutral position into the first and second shift positions and is retained in these positions by a ball catch loaded by a compression spring, the first adjusting wheel is mounted on the adjusting shaft on the exterior of the side wall, axial movement of the adjusting shaft is limited in the outward direction by a supporting wall of the bearing and in the inward direction by a ring fixed on the adjusting shaft on the exterior of the side wall, which ring is in contact with a limit switch when the adjusting

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clamping nuts 19. Furthermore the gear rim 66 is clamped to the driving gear 68 of the turning drum 6 by the clamping claws 71 by means of the clamping screws 70 and the toothed segment 60 is again secured by the clamping screws 63.

This re-establishes all the connections in the new position of the machine.

Before the lock on the rear segments 11 is released it is necessary to shift the adjusting shaft 44 axially into the shift position 48 by means of the crank 46. The claws 29 fixed to the bar 28 are then lifted out of the lateral pins 22 of the rear sheet-rest segments 11, whereby the limit switch 36 is released and the limit switch 34 pressed. The release of the limit switch 36 operates the magnet plunger 56 in such a way that the second shift position 49 is again blocked for change of format. In the subsequent axial movement of the adjusting shaft 44 into the disconnected stop position 47, the second limit switch 54 which is fitted for protection of the machine is pressed by way of the ring 52 fixed on the adjusting shaft 44 and, together with the limit switch 34, releases the machine for electric operation.

When the unit producing suction air for the sucker bar 2 at the rear edge of the sheet has been switched on, the machine is again ready for operation.

Resetting from perfecting to first printing is carried out in inverse order.

The embodiment of the invention described above provides a trouble-free change which automatically ensures accuracy of alignment, both for first and also for perfection printing, and which is capable of handling sheets within a wide range of format sizes. All the operations involved in changing between first- and perfection-printing are combined and are effected by means of a single adjustment control located outside the machine. This arrangement is particularly convenient because the relative settings of the cylinders and the format size can be set on and read from a common scale. Moreover the risk of damage to the machine is removed because all the shifting operations are protected by safety devices. In comparison with previous machines, the adjusting mechanism is cheap and compact and convenient to operate. Consequently the level of skill and responsibility required in the machine operation is thus kept within acceptable limits and the length of the periods during which the machine is idle are reduced. Furthermore the apparatus does not cause undue wear in the gripper elements.

WHAT WE CLAIM IS:—

1. A sheet-fed rotary printing machine including a guide drum for receiving sheets from a first impression cylinder, a turning drum for feeding sheets to a second im-

pression cylinder, a storage drum for transferring sheets from the guide drum to the turning drum, the said storage drum being adjustable to carry sheets of different formats and including sheet grippers which are operated by an adjustable cam, and an adjusting mechanism comprising an adjusting shaft carrying first and second adjusting wheels, the said shaft being movable between a first shift position, in which the first adjusting wheel is in driving engagement with a mechanism for adjusting the relative dispositions of the drums, whereby the machine can be converted between first- and perfection-printing, and a second shift position in which the first adjusting wheel is in driving engagement with a mechanism for effecting adjustment of the storage drum to accommodate sheets of different formats and in which the second adjusting wheel is in driving engagement with a mechanism for adjusting the position of the cam.

2. A printing machine according to claim 1 wherein the cam causes displacements of a cam follower which are small compared with the radius of the storage drum and which occur along a path which is inclined at a shallow gradient to the peripheral surface of the drum.

3. A printing machine according to claim 1 or claim 2 wherein the adjusting shaft is movable from a neutral position into the first and second shift positions.

4. A printing machine according to claim 3, wherein one or more security devices are provided for preventing accidental movement of the adjusting shaft into the first and second positions.

5. A printing machine according to claim 4, wherein one security device comprises a ring mounted on the adjusting shaft and a limit switch disposed radially outwardly from the adjusting shaft for actuation by the ring upon axial movement of the adjusting shaft from the neutral position into the first position, and another security device comprises an electromagnetically movable stop which prevents movement of the adjusting shaft into the second position.

6. A printing machine according to any one of claims 1 to 5, wherein the adjusting shaft is rotatably mounted in a bearing fixed to a side wall of the machine and may be slid axially from a neutral position into the first and second shift positions and is retained in these positions by a ball catch loaded by a compression spring, the first adjusting wheel is mounted on the adjusting shaft on the exterior of the side wall, axial movement of the adjusting shaft is limited in the outward direction by a supporting wall of the bearing and in the inward direction by a ring fixed on the adjusting shaft on the exterior of the side wall, which ring is in contact with a limit switch when the adjusting



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shaft is in the neutral position, and, when the adjusting shaft is in the first shift position, co-operates with an electromagnetically movable plunger to prevent movement of the adjusting shaft into the second shift position, and the side wall has an aperture which communicates with a recess on the interior of the side wall which receives the second adjusting wheel mounted on the end of the adjusting shaft inside of the side wall, a crank being fixed to the outer end of the adjusting shaft as a means of adjustment.

7. A printing machine according to any one of claims 1 to 6, wherein the second adjusting wheel is fixed adjacent the end of the adjusting shaft on the inside of a side wall of the machine and the mechanism for adjusting the cam comprises an adjusting member mounted for rotation about the axis of the storage drum engageable with the second adjusting wheel and carrying the cam, and means for fixing the adjusting member relative to the side wall of the machine.

8. A printing machine according to any one of claims 1 to 7 wherein the storage drum comprises at least two segments one of which is movable relative to the other about the axis of rotation of the storage drum and releasable securing means for releasably securing the segments to each other, and means is provided for releasably securing one of the segments whilst allowing movement of the other relative thereto.

9. A printing machine according to claim 8, wherein the storage drums comprise a plurality of front segments fixed to a shaft, a plurality of rear segments rotatably mounted on the shaft and a clamping device mounted on the front segments for clamping the rear segments to the front segments, and further including releasable securing means for securing the rear segments to the side walls of the machine.

10. A printing machine according to claim 9 wherein the releasable securing means comprises a rotatable bar extending across the whole width of the storage drum, to which bar are fixed, between side walls of the machine and the outer two rear segments, catches which can be brought into engagement with pins fixed to the outer two rear segments of the storage drum by movement of a spring-loaded actuating lever.

11. A printing machine according to claim 10 wherein a securing pin is provided under one catch in order to prevent accidental actuation of the releasable securing means and limit switches are fixed adjacent the catch and the spring-loaded actuating lever in order to detect movement thereof.

12. A printing machine according to any one of claims 9 to 11 wherein the releasable securing means comprises pins mounted on the outer two front segments

on which adjustable clamping pieces are retained by means of clamping nuts, and flanges fixed to the outer sides of the outer two rear segments which can be clamped to the front segments by the clamping nuts by means of the clamping pieces.

13. A printing machine according to any one of claims 1 to 12 wherein the relative dispositions of the drums and the relative disposition of the sheet support means and the storage drum are indicated on a common scale device on a drive wheel of the machine, the said scale device including two relatively movable parts and means for securing the two parts together.

14. A printing machine according to any one of the preceding claims wherein the mechanism for adjusting the relative dispositions of the drums comprises a drive wheel mounted on a drive shaft of the storage drum and in engagement with a further drive wheel which is mounted for rotation about the axis of rotation of the turning drum and which can be coupled to a drive shaft of the turning drum.

15. A printing machine according to claim 14 wherein the drive wheel of the turning drum comprises a gear rim releasably clamped on a shoulder of a driving wheel mounted on the drive shaft of the turning drum.

16. A printing machine according to claim 16 wherein a marker is provided on a claw which clamps the gear rim to the driving wheel and a pointer is fixed on the side of the driving wheel adjacent the side wall of the machine and is disposed on the outside of the side wall of the machine adjacent the driving wheel.

17. A printing machine according to claim 16, wherein the gear rim is provided with a hole in which is disposed a spring-loaded locating pin adapted for engagement in one or other of two fixing holes in the driving wheel of the turning drum corresponding to the relative dispositions of the drums for first and perfection printing.

18. A printing machine according to any one of claims 1 to 17, wherein the mechanism for adjusting the position of the cam comprises an adjusting member carrying the cam and having an externally toothed segment engageable with the second adjusting wheel.

19. A printing machine according to any one of claims 1 to 17, wherein the mechanism for adjusting the position of the cam comprises an adjusting plate carrying the cam and having a toothed section engaged with a toothed belt which is engageable by the second adjusting wheel.

20. A printing machine according to any one of claims 1 to 17, wherein the mechanism for adjusting the position of the cam comprises an adjusting plate carrying the cam and having a section provided with chain

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toothings engaged with a chain which is engageable by the second adjusting wheel.

21. A printing machine according to claim 20, wherein the chain toothings run over part of a circumferential portion of the adjusting plate and to which a chain is linked.

22. A printing machine according to any one of claims 1 to 17, wherein the second adjusting wheel is provided with a friction facing and the mechanism for adjusting the posi-

tion of the cam comprises a friction wheel carrying the cam.

23. A printing machine substantially as hereinbefore described with reference to the accompanying drawings.

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