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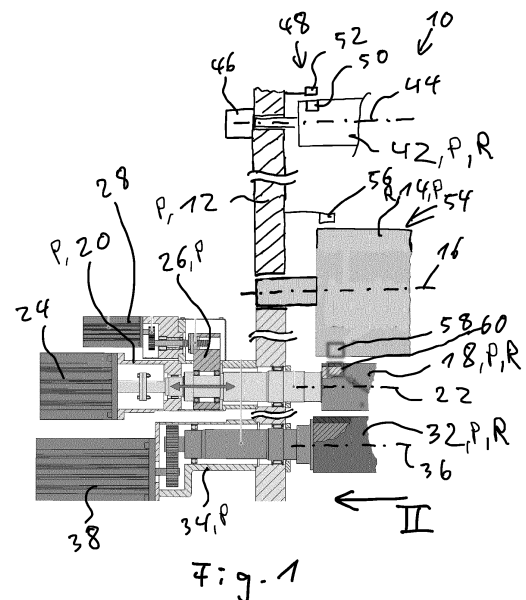
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(54) **PRINTING MACHINE**

(57) A printing machine (10), especially a flexographic printing machine, is described. The printing machine (10) comprises at least two machine parts (P) being movable with respect to each other. Moreover, a reference position detection unit (48, 54) is provided which comprises a magnetic element (50, 56, 60) and a magnetic detector (52, 58) being configured for detecting a characteristic of a magnetic field being generated by the magnetic element (50, 56, 60). One of the magnetic element (50, 56, 60) and the magnetic detector (52, 58) is arranged on one of the machine parts (P) and the respective other one of the magnetic element (50, 56, 60) and the magnetic detector (52, 58) is arranged on the respective other one of the machine parts (P), such that a reference position of one of the machine parts (P) with respect to the other one of the machine parts (P) is detectable in that the magnetic detector (52, 58) detects a characteristic of the magnetic field being generated by the magnetic element (50, 56, 60).



Description

[0001] The invention relates to a printing machine, especially a flexographic printing machine, comprising at least two machine parts being movable with respect to each other.

[0002] It is understood that in the present context two machine parts are also considered to be movable with respect to each other if only one of the machine parts is technically movable and the other one is stationary.

[0003] Such printing machines are known in the art. In order to precisely operate the printing machine the machine parts thereof need to be arranged in a defined position with respect to each other.

[0004] This is especially the case for movable machine parts since such parts can only be moved in a desired manner if a starting position of the movement is known. Such a starting position may also be called a zero position or reference position. The terms zero position, reference position and starting position are considered to be synonyms.

[0005] In known printing machines the machine parts may be manually arranged in their corresponding reference positions. To this end, e.g. gauge blocks may be arranged in between the machine parts or between at least one of the machine parts and a reference part. It is also known to arrange machine parts in their corresponding reference position by withdrawing them from the printing machine and inserting them into a referencing unit. Once the machine parts are in the reference position, this relative position is fixed and the machine parts are reintegrated into the printing machine.

[0006] The problem to be solved by the present invention is to facilitate the precise arrangement of machine parts within a printing machine, i.e. to facilitate the arrangement of the machine parts in their respective reference position.

[0007] The problem is solved by a printing machine of the type as mentioned above which comprises a reference position detection unit comprising a magnetic element and a magnetic detector being configured for detecting a characteristic of a magnetic field being generated by the magnetic element. One of the magnetic element and the magnetic detector is arranged on one of the machine parts and the respective other one of the magnetic element and the magnetic detector is arranged on the respective other one of the machine parts, such that a reference position of one of the machine parts with respect to the other one of the machine parts is detectable in that the magnetic detector detects a characteristic of the magnetic field being generated by the magnetic element. Preferably, the magnetic element is a permanent magnet. The magnetic detector is for example configured for detecting a magnetic field strength. Thus, a reference position may be detected if the detected magnetic field strength has a local maximum or minimum. Alternatively, the reference position may be detected if the magnetic field strength exceeds a predefined limit or falls below a

predefined limit. Thus, the reference position may be detected with high precision. A further advantage of the reference position detection unit is that it is integrated into the printing machine. Consequently, there is no need to withdraw the machine parts from the printing machine. Furthermore, the precision of the magnetic elements and the magnetic detector is generally not affected by dust, dirt or residues resulting from a printing process performed in the printing machine. Consequently, the reference position detection unit operates in a very reliable and robust manner.

[0008] It is noted that it may be necessary to calibrate the reference position detection unit at the initial setup of the printing machine. Also after one of the at least two machine parts being movable with respect to each other has been exchanged or otherwise manipulated it may be necessary to calibrate the reference position detection unit. In other words, a value of the characteristic to be detected which corresponds to the reference position needs to be assessed. To this end, gauge blocks or other calibration means may be used. Thereafter, no further calibration is necessary, unless the printing machine is fully or partly dismantled or otherwise compromised.

[0009] In a variant, the use of the reference position detection unit may require a pre-positioning step during which the magnetic detector is brought into the vicinity of the magnetic element. This can be done manually or automatically. Such a pre-positioning step is simple since the positions of the magnetic element and the magnetic detector within the printing machine are generally known.

[0010] Preferably, the magnetic detector is configured for detecting a characteristic of the magnetic field being generated by the magnetic element along two directions. Especially, the two directions are perpendicular with respect to one another. The magnetic field generated by the magnetic element may be symmetrical with respect to a central axis. In this context, the directions along which the characteristics are to be detected may both be arranged perpendicular to the central axis. Consequently, a reference position of the machine parts may be defined and detected with respect to two directions.

[0011] One of the machine parts may be a machine frame. By definition, a machine frame is a non-movable machine part. Consequently, the machine frame is well suitable as a reference for other, movable machine parts. Moreover, integrating a magnetic element or a magnetic detector into the machine frame is simple.

[0012] Moreover, one of the machine parts may be a carrier skid or may be supported on a carrier skid, wherein the carrier skid is translatorily movable with respect to the machine frame. Thus, two alternatives are covered. In the first alternative, the movable machine part is a carrier skid. The carrier skid may be supported on the machine frame via a rail. Consequently, a reference position of the carrier skid with respect to the machine frame is arranged along the rail. In the second alternative, the machine part is supported on a carrier skid. Thus, in this alternative the magnetic element or the magnetic detec-

tor is arranged on the machine part and not on the carrier skid. In all alternatives, a reference position may be detected with high reliability and high precision.

[0013] Alternatively or additionally, one of the machine parts is a roller being rotatably supported within the printing machine. Without any limitation, the roller may be supported on a machine frame or on a carrier skid. Thus, a reference position of the roller may be detected with the reference position detection unit. Consequently, the roller is precisely positioned within the printing machine which leads to a precise and reliable performance.

[0014] According to an embodiment, the printing machine comprises at least three machine parts being movable with respect to each other. Then, the reference position detection unit comprises an additional magnetic element, wherein each of the machine parts carries either one of the magnetic elements or the magnetic detector. The basic idea is, thus, to use a single magnetic detector which is adapted for cooperating with a plurality of magnetic fields each being generated by a different magnetic element. Such a reference position detection unit is very cost-effective since the reference positions of a plurality of parts may be detected using a single detector. To this end, the machine parts carrying the magnetic elements are successively brought into the vicinity of the magnetic detector such that the respective reference position can be detected.

[0015] The printing machine may comprise at least two reference position detection units, wherein each reference position detection unit comprises a magnetic element and a magnetic detector being configured for detecting a characteristic of a magnetic field being generated by the magnetic element. The two reference position detection units may for example be arranged such that each reference position detection units is assigned to a pair of machine parts. The pairs may be formed with or without overlap, i.e. each machine part may only belong to one pair or be part of several pairs. In any case the at least two reference position detection units may be operated in parallel. Consequently, a plurality of reference positions may be detected within a relatively short time.

[0016] According to a variant, one of the machine parts is a central impression cylinder being rotatably supported within the printing machine such that the central impression cylinder is rotatable about a central impression cylinder rotation axis. The central impression cylinder may be connected to a drive unit such that it can be rotatably driven. Using the reference position detection unit, a reference position of the central impression cylinder may be easily and precisely detected. In an example, the reference position may be detected along a direction being substantially parallel to the central impression cylinder rotation axis and/or along a direction being substantially perpendicular to the central impression cylinder rotation axis. Alternatively or additionally the reference position is detected along a direction substantially corresponding to a circumferential direction of the central impression cylinder.

[0017] It is also possible that one of the machine parts is an anilox roller being rotatably supported within the printing machine such that the anilox roller is rotatable about an anilox roller rotation axis. Also the anilox roller may be connected to a corresponding drive unit such that it can be rotatably driven. A reference position of the anilox roller may be detected with high precision. Also in this context, the reference position may for example be detected along a direction being substantially parallel to the anilox roller rotation axis, along a direction being substantially perpendicular to the anilox roller rotation axis and/or a direction substantially corresponding to a circumferential direction of the anilox roller.

[0018] In this context, the anilox roller may be supported within the printing machine in a translatorily movable manner such that it is movable in a direction substantially parallel to the anilox roller rotation axis and/or such that it is movable in a direction substantially perpendicular to the anilox roller rotation axis. For each direction along which the anilox roller is translatorily movable it may be supported on a carrier skid unit being supported on the machine frame or an additional carrier skid. Thus, the anilox roller may be precisely positioned along the above directions.

[0019] According to a further variant, one of the machine parts is a plate cylinder being rotatably supported within the printing machine such that the plate cylinder is rotatable about a plate cylinder rotation axis. Also the plate cylinder may be coupled to a corresponding drive unit. Thus, the plate cylinder may be rotatably driven. A reference position of the plate cylinder may be detected with high precision. More precisely, the reference position may be detected along a direction being substantially parallel to the plate cylinder rotation axis, along a direction substantially corresponding to a circumferential direction of the plate cylinder and/or along a direction being substantially perpendicular to the plate cylinder rotation axis.

[0020] The plate cylinder may be supported within the printing machine in a translatorily movable manner such that it is movable in a direction substantially parallel to the plate cylinder rotation axis and/or such that it is movable in a direction substantially perpendicular to the plate cylinder rotation axis. For each direction along which the plate cylinder is translatorily movable it may be supported on a carrier skid unit being supported on the machine frame or an additional carrier skid unit. Thus, the plate cylinder may be precisely positioned along the above directions.

[0021] Moreover, one of the machine parts may be a winder cylinder or a winding shaft being rotatably supported within the printing machine such that the winder cylinder or the winding shaft is rotatable about a winder rotation axis. Also the winder cylinder or the winding shaft may be coupled to a corresponding drive unit. Thus, the winder cylinder or the winding shaft may be rotatably driven. A reference position of the winder cylinder or the winding shaft may be detected with high precision. As before,

the reference position may for example be detected along a direction being substantially parallel to the winder rotation axis, along a direction being substantially perpendicular to the winder rotation axis and/or along a direction substantially corresponding to a circumferential direction of the winder cylinder or the winding shaft.

[0022] It is also possible that one of the machine parts is a holding tube which is configured for rotationally supporting a winding shaft, wherein the holding tube is supported within the printing machine in a translatorily movable manner such that it is movable in a direction substantially parallel to a winder rotation axis. Such holding tubes may be used for adapting a winder unit comprising a winding shaft to different widths of winding reels to be supported by the winding shaft. Also in this alternative, a reference position of the holding tube may be detected with high precision. The reference position may for example be detected along a direction being substantially parallel to the winder rotation axis.

[0023] All of the above-mentioned reference positions may be detected during a reference position learning procedure during which each of the magnetic detectors is brought into the proximity of the corresponding magnetic element and subsequently detects the reference position being concerning to the machine parts to which the magnetic detector and the magnetic elements are attached respectively. Such a reference position learning procedure may for example be performed during a job change or when the printing machine is activated. It is also possible to perform such a reference position learning procedure once during a predefined time interval, e.g. once per day.

[0024] The invention will now be explained with reference to an embodiment which is shown in the attached drawings. In the drawings,

- Figure 1 shows a drive side portion of a printing machine according to the invention in a schematical, partly sectional view,
- Figure 2 partly shows the drive side portion of the printing machine of Figure 1 in a perspective view when being regarded along direction II,
- Figure 3 schematically shows a winder unit which can be used as an alternative to a winder unit of the printing machine of Figures 1 and 2, and
- Figure 4 shows a detail IV of the winder unit of Figure 3.

[0025] Figure 1 shows a printing machine 10 which is a flexographic printing machine.

[0026] The printing machine 10 comprises a machine part P which is a machine frame 12.

[0027] A further machine part P of the printing machine 10 is a central impression cylinder 14.

[0028] The central impression cylinder 14 is rotatably

supported on the machine frame 12, i.e. within the printing machine 10.

[0029] Consequently, the central impression cylinder 14 is rotatable about a central impression cylinder rotation axis 16.

[0030] Another machine part P of the printing machine 10 is a plate cylinder 18.

[0031] The plate cylinder 18 is rotatably supported on a first carrier skid 20 such that the plate cylinder 18 is rotatable about a plate cylinder rotation axis 22.

[0032] Moreover, the plate cylinder 18 may be actively driven by a plate cylinder drive unit 24 also being arranged on the first carrier skid 20.

[0033] The first carrier skid 20 is translatorily movable with respect to the machine frame 12 along a direction substantially perpendicular to the plate cylinder rotation axis 22.

[0034] The plate cylinder 18 is additionally supported on a second carrier skid 26 which is supported on the first carrier skid 20 such that it is translatorily movable with respect to the first carrier skid 20 along a direction being substantially parallel to the plate cylinder rotation axis 22.

[0035] The second carrier skid 26 may be actively moved with respect to the first carrier skid 20 by using a first plate cylinder translation drive 28.

[0036] The first carrier skid 20 and the second carrier skid 26 being arranged thereon may be actively driven with respect to the machine frame 12 by a second plate cylinder translation drive 30 (cf. Figure 2).

[0037] Thus, the plate cylinder 18 is supported within the printing machine 10 in a translatorily movable manner such that it is movable in a direction substantially parallel to the plate cylinder rotation axis 22 and such that it is movable in a direction substantially perpendicular to the plate cylinder rotation axis 22.

[0038] The printing machine 10 comprises a further machine part P which is an anilox roller 32.

[0039] The anilox roller 32 is rotatably supported on a third carrier skid 34, such that it is rotatable about an anilox roller rotation axis 36.

[0040] The third carrier skid 34 is translatorily movable with respect to the machine frame 12. A corresponding direction of movement is substantially perpendicular to the anilox roller rotation axis 36.

[0041] Consequently, the anilox roller 32 is also rotatably and translatorily movable on the machine frame 12 and within the printing machine 10.

[0042] The anilox roller 32 may be actively moved in both of the above manners.

[0043] In order to rotate the anilox roller 32 an anilox drive unit 38 is provided on the third carrier skid 34.

[0044] In order to translatorily move the anilox roller 32 an anilox translation drive 40 is arranged on the machine frame 12 and is coupled to the third carrier skid 34.

[0045] The third carrier skid 34 and the components of the printing machine 10 mounted thereon may also be designated an anilox station.

[0046] It is further understood that the first carrier skid 20, the second carrier skid 26 and the third carrier skid 34 are also movable machine parts P.

[0047] An additional part P of the printing machine 10 is a winder cylinder 42 being configured for winding or unwinding a substrate on which the printing machine 10 can print an image.

[0048] The winder cylinder 42 is rotatably supported on the machine frame 12 of the printing machine 10. Thus, the winder cylinder 42 is rotatable about a winder rotation axis 44.

[0049] Also the winder cylinder 42 may be actively driven by a winder cylinder drive unit 46.

[0050] The portion of the printing machine 10 comprising the winder cylinder 42 may be designated a winder unit or winder section.

[0051] It is noted that in Figure 1 the winder unit or winder section comprising the winder cylinder 42 is represented in close proximity to the printing unit being formed by the central impression cylinder 14, the plate cylinder 18 and the anilox roller 32. However, this is mainly done for illustrative purposes. In reality, the winder cylinder 42 is arranged within a certain distance from the printing unit. This distance can be several meters.

[0052] All of the above-mentioned machine parts P, especially the central impression cylinder 14, the plate cylinder 18, the anilox roller 32 and the winder cylinder 42 interact in a known manner according to the working principles of a flexographic printing machine such that an image can be printed on a substrate.

[0053] Moreover, the machine parts P are movable with respect to each other. More precisely, the central impression cylinder 14, the plate cylinder 18, the anilox roller 32 and the winder cylinder 42 are movable with respect to the machine frame 12.

[0054] In this context, each of the central impression cylinder 14, the plate cylinder 18, the anilox roller 32 and the winder cylinder 42 can simply be referred to as a roller R.

[0055] In order to perform a printing process of high quality using the printing machine 10, the machine parts P thereof need to be precisely arranged with respect to each other. To this end, a reference position of each of the machine parts P needs to be known. Using such a reference position, each of the above mentioned drive units is able to deviate a current position of the corresponding machine part P which may be used during operation.

[0056] For this reason, several reference position detection units are provided.

[0057] A first reference position detection unit 48 comprises a magnetic element 50 and a magnetic detector 52.

[0058] The magnetic element 50 is a permanent magnet and is arranged at an outer circumference of the winder cylinder 42. The magnetic detector 52 is supported on the machine frame 12.

[0059] The magnetic detector 52 is configured for de-

tecting a characteristic, in the present example a magnetic field strength, of a magnetic field being generated by the magnetic element 50.

[0060] Thus, a reference position of the winder cylinder 42 with respect to the machine frame 12 can be detected by arranging the winder cylinder 42 in a rotational position in which the magnetic detector 52 detects a maximum of the magnetic field strength.

[0061] Thus, the reference position is a rotational position of the winder cylinder 42.

[0062] A second reference position detection unit 54 has a magnetic element 56 and a magnetic detector 58. Furthermore, it comprises an additional magnetic element 60.

[0063] The magnetic element 56 and the additional magnetic element 60 are permanent magnets.

[0064] The magnetic element 56 is supported on the machine frame 12 and the magnetic detector 58 is arranged on the circumference of the central impression cylinder 14. The additional magnetic element 60 is arranged on the circumference of the plate cylinder 18.

[0065] The magnetic detector 58 is configured for detecting a magnetic field strength of a magnetic field being generated by the magnetic element 56 and a magnetic field strength of a magnetic field being generated by the additional magnetic element 60.

[0066] Thus, a reference position of the central impression cylinder 14 with respect to the machine frame 12 can be detected by arranging the central impression cylinder 14 in a rotational position in which the magnetic detector 58 detects a maximum of the magnetic field strength of the magnetic field generated by the magnetic element 56.

[0067] This reference position is a rotational position of the central impression cylinder 14.

[0068] Furthermore, a reference position of the plate cylinder 18 with respect to the central impression cylinder 14 can be determined. This is done along two directions.

[0069] A first direction corresponds to a circumferential direction of the plate cylinder 18.

[0070] Thus, the reference position along this direction is detected by arranging the plate cylinder 18 in a rotational position in which the magnetic detector 58 detects a maximum of the magnetic field strength of the magnetic field generated by the additional magnetic element 60.

[0071] This reference position may also be called a length register reference position.

[0072] A second direction is substantially parallel to the plate cylinder rotation axis 22.

[0073] Thus, the reference position along this direction is detected by arranging the plate cylinder 18 in a translatory position in which the magnetic detector 58 detects a maximum of the magnetic field strength of the magnetic field generated by the additional magnetic element 60. To this end, the first plate cylinder translation drive 28 is operated.

[0074] This reference position may also be called a side register reference position.

[0075] It is noted that the reference position of the plate cylinder 18 with respect to the central impression cylinder 14 is a relative position. Thus, this reference position could equally be designated a reference position of the central impression cylinder 14 with respect to the plate cylinder 18.

[0076] A third reference position detection unit 62 comprises a magnetic element 64, an additional magnetic element 66 and a magnetic detector 68 (cf. Figure 2).

[0077] The magnetic element 64 is a permanent magnet and is arranged on the third carrier skid 34 on which the anilox roller 32 is supported.

[0078] The additional magnetic element 66 is also a permanent magnet and is positioned on the first carrier skid 20 on which also the plate cylinder 18 is supported.

[0079] The magnetic detector 68 is arranged on the machine frame 12.

[0080] Thus a reference position of the third carrier skid 34 with respect to the machine frame 12 can be detected by arranging the third carrier skid 34 in a translatable position in which the magnetic detector 68 detects a maximum of the magnetic field strength of the magnetic field generated by the magnetic element 64. To this end, the anilox translation drive 40 is operated.

[0081] A reference position of the first carrier skid 20 with respect to the machine frame 12 can be detected by arranging the first carrier skid 20 in a translatable position in which the magnetic detector 68 detects a maximum of the magnetic field strength of the magnetic field generated by the additional magnetic element 66. To this end the second plate cylinder translation drive 30 is operated.

[0082] It is noted that the above translatable reference positions need to be detected subsequently since the reference position detection unit 62 only comprises on magnetic detector 68.

[0083] Once the above translatable reference positions are known, also a reference gap between the plate cylinder 18 and the central impression cylinder 14 as well as a reference gap between the plate cylinder 18 and the anilox roller 32 is known. This is due to the fact that the translatable position of the central impression cylinder 14 on the machine frame 12 is known. Furthermore, the positions of the plate cylinder 18 and the anilox roller 32 on the respective carrier skids 20, 26, 34 is also known.

[0084] These reference gaps can be used for precisely adjusting the gap between the plate cylinder 18 and the central impression cylinder 14 as well as the gap between the plate cylinder 18 and the anilox roller 32.

[0085] It is noted that the present printing machine 10 has been explained with a focus on the so-called drive side. It is understood that additional reference position detection units may be arranged on the so-called operator side, i.e. on a side being opposed to the ends of the central impression cylinder 14, the plate cylinder 18 and the anilox roller 32 as shown in Figure 1.

[0086] In other words, the arrangement of reference position detection units can be mirrored along a middle

plane of the printing machine 10.

[0087] Figures 3 and 4 show an alternative winder unit which can be used as a replacement of the winder unit of the printing machine 10 explained in connection with Figure 1.

[0088] The winder unit of Figures 3 and 4 comprises two clamping units 70a, 70b which are configured for holding a tubular core of a winder reel at opposing ends.

[0089] In the representation of Figure 3, the clamping unit 70a may be designated a right clamping unit and the clamping unit 70b may be designated a left clamping unit.

[0090] The clamping units 70a, 70b are structurally identical. Consequently, only the clamping unit 70a will be described in the following. The explanations apply to the clamping unit 70b *mutatis mutandis*.

[0091] The winding unit 70a comprises a winding shaft 72. A first end of the winding shaft 72 is coupled to a winder cylinder drive unit 46. Consequently, the winding shaft 72 can be actively driven.

[0092] A second end of the winding shaft 72 comprises a holding stub 73 being configured for being inserted into the tubular core of a winder reel in order to support and rotate the winder reel within the printing machine 10.

[0093] Moreover, the winding shaft 72 is supported inside a holding tube 74 and the winder cylinder drive unit 46 is attached to an end of the holding tube 74.

[0094] The holding tube 74 is slidably supported on the machine frame 12. Thus, the clamping unit 70a can be adapted to winder reels of different widths W along a winder rotation axis 44 in that the assembly comprising the holding tube 74, the winding shaft 72 and the winder cylinder drive unit 46 is translated with respect to the machine frame 12 along the winder rotation axis 44.

[0095] The winding shaft 72 and the holding tube 74 are movable machine parts P of the printing machine 10.

[0096] In order to detect an axial reference position of the holding tube 74 with respect to the machine frame 12, a reference position detection unit 76 is provided.

[0097] The reference position detection unit 76 comprises a magnetic element 78 which is attached to an outer circumference of the holding tube 74 and a magnetic detector 80 which is mounted on the machine frame 12.

[0098] The magnetic element 78 is a permanent magnet.

[0099] The magnetic detector 80 is configured for detecting a characteristic, in the present example a magnetic field strength, of a magnetic field being generated by the magnetic element 78.

[0100] Thus, a reference position of the holding tube 74 with respect to the machine frame 12 can be detected by arranging the holding tube 74 in an axial position in which the magnetic detector 80 detects a maximum of the magnetic field strength.

[0101] For detecting a rotational reference position of the winding shaft 72 with respect to the holding tube 74, a reference position detection unit 82 is provided.

[0102] The reference position detection unit 82 com-

prises a magnetic element 84 which is attached to an outer circumference of the winding shaft 72 and a magnetic detector 86 which is mounted on the holding tube 74.

[0103] As before, the magnetic element 84 is a permanent magnet.

[0104] The magnetic detector 86 is configured for detecting a characteristic, in the present example a magnetic field strength, of a magnetic field being generated by the magnetic element 84.

[0105] Thus, a reference position of the winding shaft 72 with respect to the holding tube 74 can be detected by arranging the winding shaft 72 in a rotational position in which the magnetic detector 86 detects a maximum of the magnetic field strength.

[0106] In a further variant of the winder unit as shown in Figures 3 and 4 two or more magnets 78 may be provided on the outer circumference of the holding tube 74 being spaced from each other along the winder rotation axis 44.

[0107] Each of these magnets 78 is configured for interacting with the magnetic detector 80 when the clamping unit 70a is in a predefined axial position corresponding to a predefined width of a winder reel to be held by the clamping units 70a, 70b.

Claims

1. Printing machine (10), especially flexographic printing machine, comprising at least two machine parts (P) being movable with respect to each other,

characterized by a reference position detection unit (48, 54, 62, 76, 82) comprising a magnetic element (50, 56, 60, 64, 66, 78, 84) and a magnetic detector (52, 58, 68, 80, 86) being configured for detecting a characteristic of a magnetic field being generated by the magnetic element (50, 56, 60, 64, 66, 78, 84), wherein one of the magnetic element (50, 56, 60, 64, 66, 78, 84) and the magnetic detector (52, 58, 68, 80, 86) is arranged on one of the machine parts (P) and the respective other one of the magnetic element (50, 56, 60, 64, 66, 78, 84) and the magnetic detector (52, 58, 68, 80, 86) is arranged on the respective other one of the machine parts (P), such that a reference position of one of the machine parts (P) with respect to the other one of the machine parts (P) is detectable in that the magnetic detector (52, 58, 68, 80, 86) detects a characteristic of the magnetic field being generated by the magnetic element (50, 56, 60, 64, 66, 78, 84).

2. Printing machine (10) according to claim 1, **characterized in that** the magnetic detector (52, 58, 68, 80, 86) is configured for detecting a characteristic of

the magnetic field being generated by the magnetic element (50, 56, 60, 64, 66, 78, 84) along two directions, especially wherein the two directions are perpendicular with respect to one another.

3. Printing machine (10) according to claim 1 or 2, **characterized in that** one of the machine parts (P) is a machine frame (12).

4. Printing machine (10) according to claim 3, **characterized in that** one of the machine parts (P) is a carrier skid (20, 26, 34) or is supported on a carrier skid (20, 26, 34), wherein the carrier skid (20, 26, 34) is translatorily movable with respect to the machine frame (12).

5. Printing machine (10) according to any of the preceding claims, **characterized in that** one of the machine parts (P) is a roller (R) being rotatably supported within the printing machine (10).

6. Printing machine (10) according to any of the preceding claims, **characterized by** at least three machine parts (P) being movable with respect to each other, wherein the reference position detection unit (48, 54, 62, 76, 82) comprises an additional magnetic element (50, 56, 60, 64, 66, 78, 84), wherein each of the machine parts (P) carries either one of the magnetic elements (50, 56, 60, 64, 66, 78, 84) or the magnetic detector (52, 58, 68, 80, 86).

7. Printing machine (10) according to any of the preceding claims, **characterized by** at least two reference position detection units (48, 54, 62, 76, 82), wherein each reference position detection unit (48, 54, 62, 76, 82) comprises a magnetic element (50, 56, 60, 64, 66, 78, 84) and a magnetic detector (52, 58, 68, 80, 86) being configured for detecting a characteristic of a magnetic field being generated by the magnetic element (50, 56, 60, 64, 66, 78, 84).

8. Printing machine (10) according to any of the preceding claims, **characterized in that** one of the machine parts (P) is a central impression cylinder (14) being rotatably supported within the printing machine (10) such that the central impression cylinder (14) is rotatable about a central impression cylinder rotation axis (16).

9. Printing machine (10) according to any of the preceding claims, **characterized in that** one of the machine parts (P) is an anilox roller (32) being rotatably supported within the printing machine (10) such that the anilox roller (32) is rotatable about an anilox roller rotation axis (36).

10. Printing machine (10) according to claim 9, **characterized in that** the anilox roller (32) is supported with-

in the printing machine (10) in a translatorily movable manner such that it is movable in a direction substantially parallel to the anilox roller rotation axis (36) and/or such that it is movable in a direction substantially perpendicular to the anilox roller rotation axis (36). 5

11. Printing machine (10) according to any of the preceding claims, **characterized in that** one of the machine parts (P) is a plate cylinder (18) being rotatably supported within the printing machine (10) such that the plate cylinder (18) is rotatable about a plate cylinder rotation axis (22). 10

12. Printing machine (10) according to claim 11, **characterized in that** the plate cylinder (18) is supported within the printing machine (10) in a translatorily movable manner such that it is movable in a direction substantially parallel to the plate cylinder rotation axis (22) and/or such that it is movable in a direction substantially perpendicular to the plate cylinder rotation axis (22). 15 20

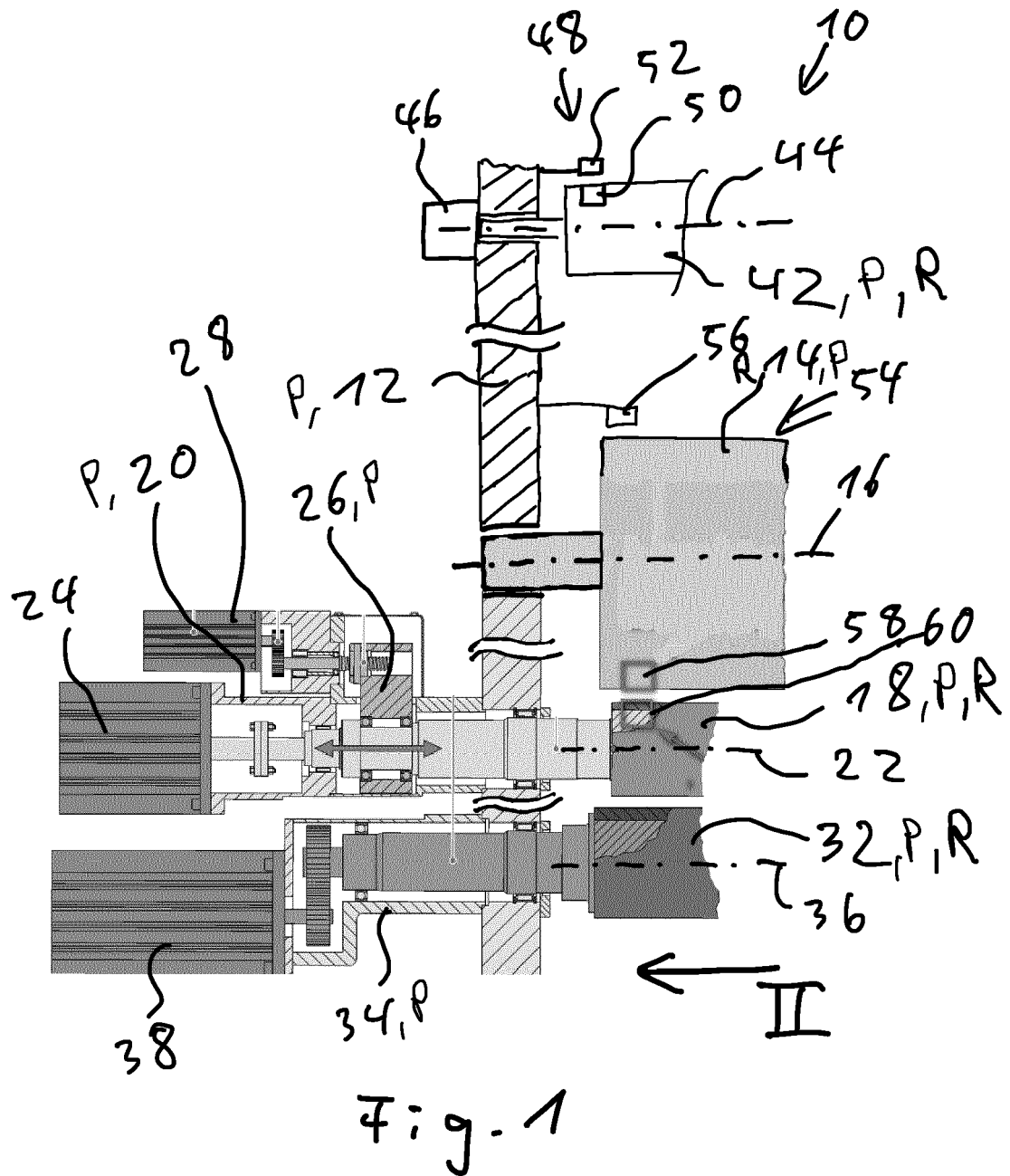
13. Printing machine (10) according to any of the preceding claims, **characterized in that** one of the machine parts (P) is a winder cylinder (42) or a winding shaft (72) being rotatably supported within the printing machine (10) such that the winder cylinder (42) or the winding shaft (72) is rotatable about a winder rotation axis (44). 25 30

14. Printing machine (10) according to any of the preceding claims, **characterized in that** one of the machine parts (P) is a holding tube (74) which is configured for rotationally supporting a winding shaft (72), wherein the holding tube (74) is supported within the printing machine (10) in a translatorily movable manner such that it is movable in a direction substantially parallel to a winder rotation axis (44). 35 40

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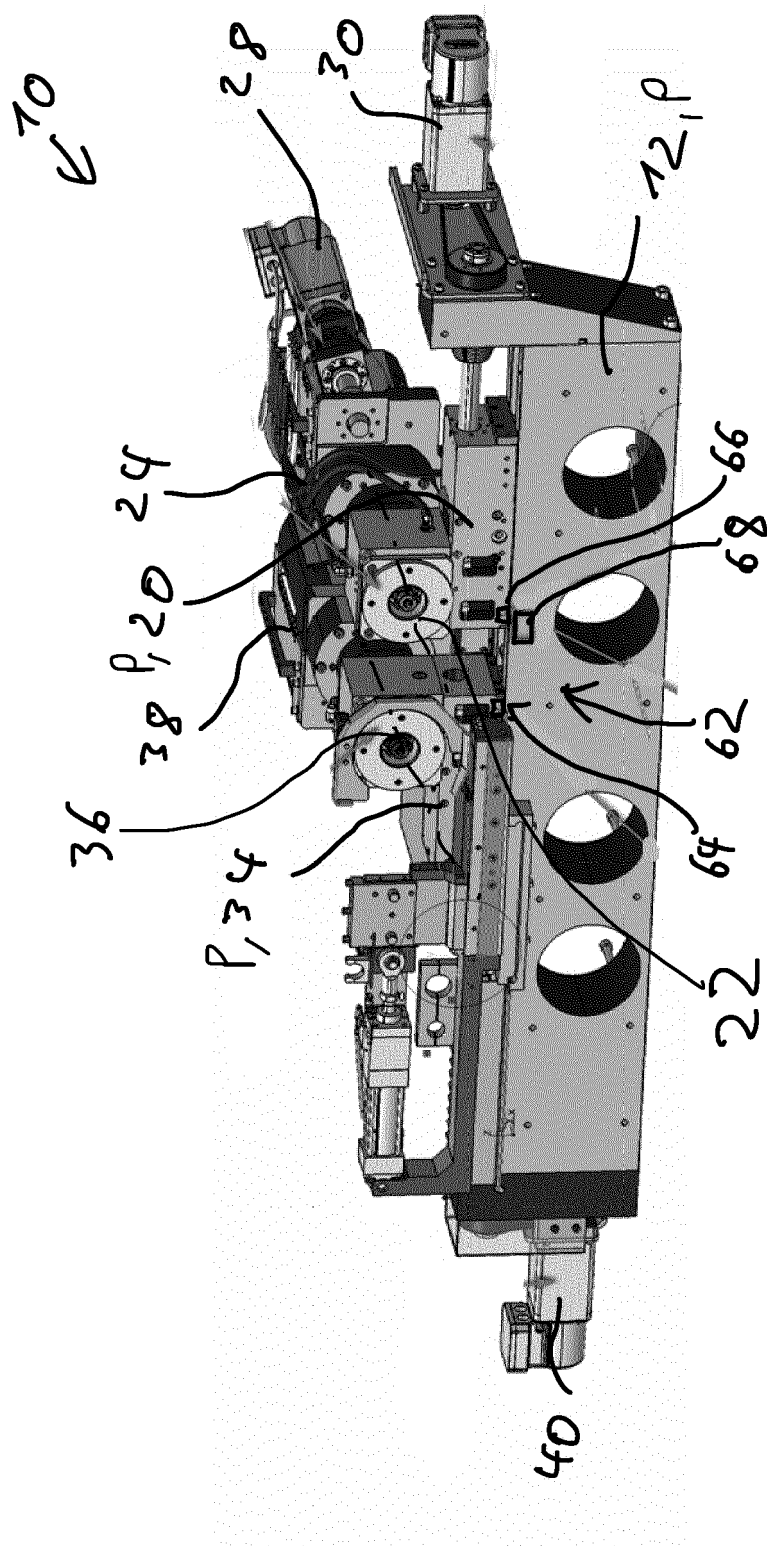


Fig. 2

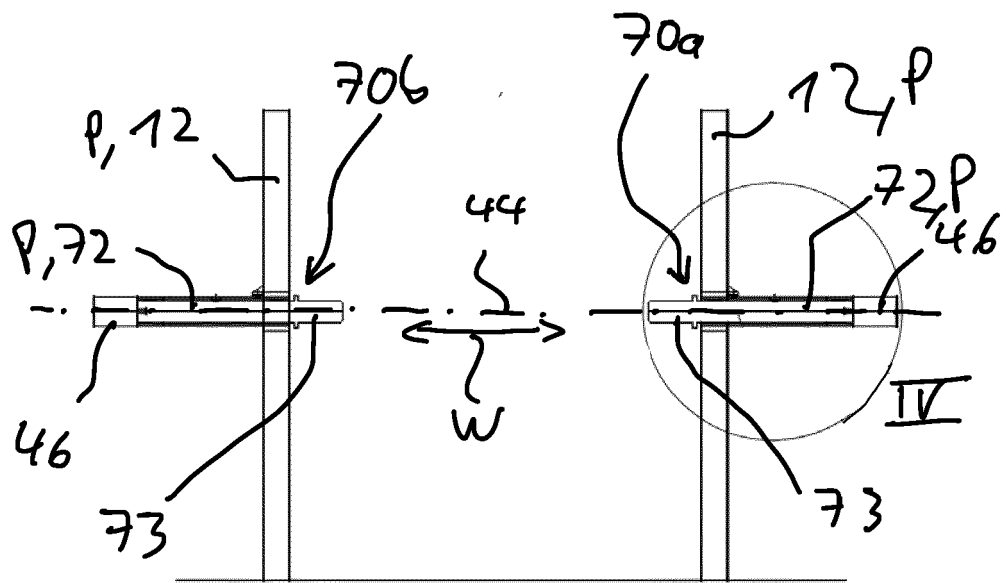


Fig. 3

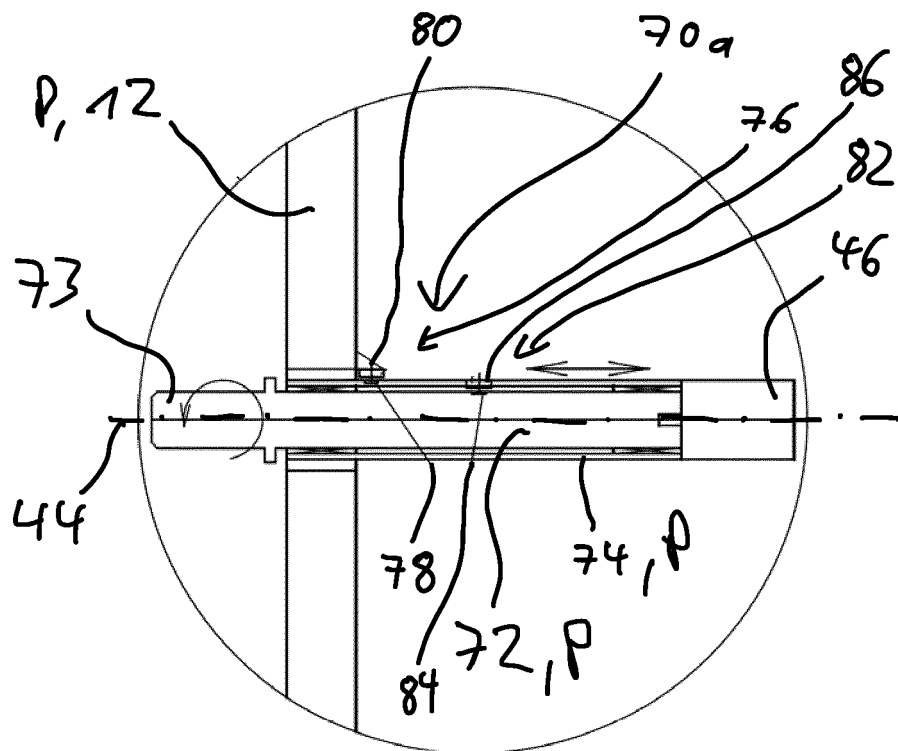


Fig. 4



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Application Number

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