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(54) FLEXOGRAPHIC PRINTING MACHINE

(57) A flexographic printing machine (1) comprising at least one support structure (2), at least one printing roller (3) pivotably mounted on said support structure (2) and configured to be driven in rotation about a rotation axis (X) and to be intercepted by a tape (N) of material to be printed, said printing roller (3) comprising at least one support core (4) pivotably mounted on said support structure (2); at least one tubular element (5) mechanically connected to said core (4) and extending along said rotation axis (X); connecting means (6) at least partially interposed between said support core (4) and said tubular element (5) and configured to mechanically connect them; said connecting means (6) comprising at least one protruding element (7), extending from said support core (4) radially with respect to said rotation axis (X); at least one housing seat (9) formed on an inner wall of said tubular element (5) and configured to house said protruding element (7) of said support core (4); said protruding element (7) is provided with at least two side walls (8) inclined with respect to said rotation axis (X), and said housing seat (9) is provided with two stop walls (10) inclined with respect to said rotation axis (X) and configured to receive said inclined side walls (8) of said protruding element (7) in bump.

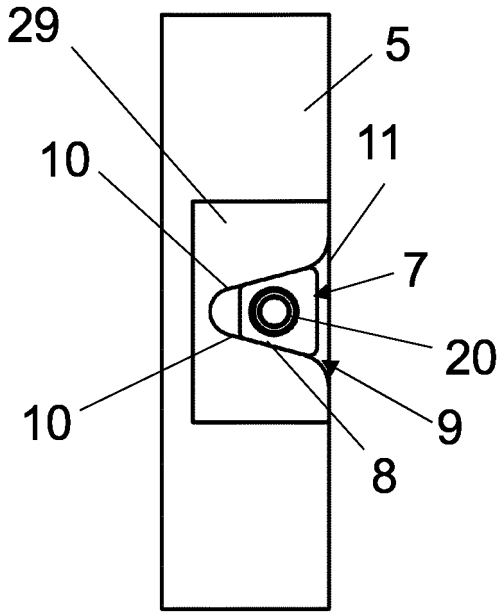

FIG. 10

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Description

[0001] The present invention relates to a flexographic printing machine, as well as a printing roller for a flexographic printing machine, according to the respective independent claims.

[0002] The flexographic printing machine in question concerns the technical field of the manufacturing and marketing of industrial printing machines and devices, in particular for printing on flexible substrates, e.g. for product packaging, e.g. on plastic or paper or aluminium tapes or similar.

[0003] In particular, the flexographic printing machine in question is of the rotary type, i.e. it uses the rotation of suitably arranged rollers on which the tape of material to be printed runs.

[0004] Rotary flexographic printing machines normally comprise, as is well known, several printing units or assemblies, varying in number according to requirements. Each printing unit comprises a printing roller (or cylinder), known in the industry's technical jargon as a 'cliché-holder', an inking roller (or cylinder), known in the industry's technical jargon as an 'anilox', and a back-pressure roller (or cylinder).

[0005] The back-pressure roller is configured to be arranged parallel to the printing roller by defining with the latter a passage gap for the tape, thus acting as a stop during printing and allowing the ink to be impressed on the tape to be printed.

[0006] The back-pressure roller, in the case of well-known central drum machines type, is common to all printing units and arranged substantially centrally with the printing rollers arranged around it, all with a parallel axis of rotation between them. The printing and inking rollers normally also comprise respective externally fitted tubular elements, known as 'sleeves'. On the sleeves fitted to the printing rollers is applied, e.g. by double-sided adhesive bonding, a photopolymer of soft engraved material known in industry jargon as a 'cliché' (hence the term 'cliché holder' for printing rollers). Alternatively, the plate can be shaped into a tubular element, which is inserted or fitted to size on a respective sleeve.

[0007] The printing and or inking rollers are mounted in a known sliding manner on side guides, so that different formats can be printed. The print format is determined by the diameter of the printing roller comprising the thickness of the engraved photopolymer (or plate).

[0008] This type of flexographic printing machine briefly described so far is commonly referred to by the technical term "Gearless", wherein each roller or cylinder is rotated by a motor, e.g. a brushless motor, controlled via a vector control system. The motor can be connected to the roller directly, or via a transmission, or even via pulleys or a gearbox.

[0009] The control system allows a synchronised rotation speed of the rollers, during the printing phase, so that the peripheral speed of the three rollers - printing, inking and back-pressure- is the same, dragging the tape to be printed without incurring the risk of stretching of the latter due to relative speeds between these rollers.

[0010] It is easy to see how it is necessary that all the rollers of the flexographic printing machine briefly described so far must be perfectly synchronised, and that the coupling with the respective sleeves and plates must be extremely precise in order to achieve optimum printing on the tape to be printed that intercepts them.

[0011] To this end, ball screws (or some other type of drive familiar to the technician in the field) driven by electronically controlled electric motors, each equipped with a precision position transducer, are usually provided for the linear movement of the rollers. The balls crews are intended to engage a nut or similar attached to a respective support cart of the printing and inking roller.

[0012] An encoder is then mounted on each motor, thanks to which it is possible to precisely determine the position or longitudinal displacement of the corresponding cart and thus uniquely determine the position of the respective cylinder to be used in the automatic motor control and thus the linear displacement control of the corresponding rollers.

[0013] In such machines, the theoretical diameter of each roller, in particular the printing roller, must be precisely determined and the relevant printing position derived, which in turn determines the correct printing position and pressure.

[0014] The correct print position results in good quality printing, while incorrect positions can result in a print area that is too thick or wide or too thin, which can also cause damage to the photopolymer.

[0015] This precise positioning of the rollers is completely nullified if the sleeve combination on the rollers is inaccurate or has any mechanical clearance.

[0016] Indeed, in this situation, the sleeve of the respective printing or inking rollers could move, thus misaligning the plate with respect to the references, forcing the operators to reposition all the rollers manually.

[0017] In the known technique of manual cylinder positioning , the operator, after bringing the printing and inking rollers to a distance of a few tenths of a millimetre from the back pressure and printing rollers respectively, in relation to the theoretical printing height, advances the printing and inking rollers a little at a time by increasing or decreasing the distance and checking the position visually.

[0018] The operator then runs a print cycle and repeats the above operations until the desired print quality is achieved.

[0019] In order to improve and speed up the coupling of sleeves onto their respective printing rollers or inking rollers, coupling means are known to comprise at least one tooth (or 'pin') protruding from the outer surface of the roller and a housing cut out of the sleeve, configured to receive the roller pin during the respective coupling during the press preparation phase.

[0020] However, even these known coupling means flexographic machine have proven in practice not to be

without drawbacks.

[0021] The main drawback lies in the fact that the pins of known machine coupling means are essentially cylindrical in shape. This cylindrical pin shape brings with it the drawback of a small bearing area once inserted into the sleeve housing.

[0022] In this situation, with normal use of the known machine type, the housing tends to deform under the punctual action of the cylindrical pin, leading, over time, to mechanical clearance between pin and housing.

[0023] Therefore, the coupling means of known machine types have the inherent drawback of having to periodically replace the sleeve seat and/or roller pin to achieve precise coupling between them.

[0024] A further drawback is that the operator, before running a known machine type, must necessarily carry out the aforementioned test print run to check that all rollers and their sleeves are properly positioned, leading to wasted material, increased printing costs and time.

[0025] A further drawback is that the continuous wear of the pin and its seat leads to the formation of mechanical clearance. By losing the perfect coupling between the roller and sleeve, the operator loses the reference for the print register when setting up the machine, forcing the operator to repeat print runs until the desired print quality is achieved.

[0026] Examples of flexographic printing machines equipped with printing rollers with a respective cylindrically shaped protruding tooth (or 'pin'), described and commented on above, are described in documents US2017008269 and US2017305180.

[0027] Furthermore, an example of a pin for positioning and adjusting a cliché on a printing roller (and therefore not relevant to the subject matter of the present invention) is described in document EP0711664. Such a pin and the corresponding seat formed in the plate are configured to define a mechanical clearance once mechanically coupled, to allow the operator to adjust the positioning of the plate on the printing roller.

[0028] It is therefore the purpose of the invention to propose a flexographic printing machine and a printing roller for a flexographic printing machine comprising safe and reliable means of coupling between rollers and their sleeves.

[0029] Another purpose of the invention is to propose a flexographic printing machine that is constructively completely reliable.

[0030] Another purpose of the invention is to propose a flexographic printing machine that is capable of limiting maintenance work due to poor mechanical coupling between rollers and their sleeves, in particular limiting the need to carry out print proofs or re-setting of the machine each time it is started up by such proofs.

[0031] Another purpose of the invention is to propose a flexographic printing machine that allows quick and easy mounting of sleeves on their rollers.

[0032] Another purpose of the invention is to propose a flexographic printing machine and a printing roller for a flexographic printing machine constructively simple.

[0033] Another purpose of the invention is to propose a flexographic printing machine and a printing roller for a flexographic printing machine that are improved and/or alternative to conventional solutions.

[0034] Another purpose of the invention is to propose a flexographic printing machine and a printing roller for a flexographic printing machine that can be realised easily, quickly and at low cost.

[0035] Another purpose of the invention is to propose a roller for a flexographic printing machine that can also be used in commercially available flexographic printing machines.

[0036] Another purpose of the invention is to propose a machine with a small footprint and simple, fast, and intuitive operation.

[0037] Another purpose of the invention is to propose a machine and a roller that can be produced simply, quickly and at low cost.

[0038] All of these purposes, either singly or in any combination thereof, and others which will result from the following description are achieved, according to the invention, with a flexographic printing machine having the characteristics set forth in claim 1 and a printing roller for a flexographic printing machine having the characteristics set forth in claim 10.

[0039] The present invention is herein further clarified in a preferred form of practical embodiment, shown for illustrative and non-limiting purposes only with reference to the attached drawings, wherein:

- Figure 1 shows a perspective view of a flexographic printing machine of the invention with the front cover protecting the operating zone in a partially open condition,
- Figure 2 shows it in front view in section to better highlight the working area,
- Figure 3 shows a plan view of a printing roller for a flexographic printing machine, which is also an object of the present invention,
- Figure 4 shows the printing roller for a flexographic printing machine in perspective view,
- Figure 5 shows in perspective view a detail of the printing roller in figure 4, concerning the connecting means;
- Figure 6 shows in perspective view an enlarged detail of Fig. 5, concerning a protruding element of the connecting means;
- Figure 7 shows in perspective view the protruding element of the connecting means of the printing roller, with some parts removed to better highlight others;
- Figure 8 shows in plan view from above the protruding element of the connecting means of figure 7,
- Figure 9 shows a cross-sectional schematic of the connecting means of the printing roller in a release configuration,

Figure 10 shows a schematic cross-sectional view of the media connecting the printing roller in a clamping configuration;

Figure 11 shows a plan view from above of a printing roller in its second realised form;

figure 12 shows the printing roller of figure 11 in a perspective view;

figure 13 shows an enlarged detail of the printing roller in figure 12, concerning a protruding element of the connecting means.

[0040] As can be seen from the figures, the flexographic printing machine that is the subject of the present invention has been identified as a whole by reference 1 in the attached figures.

[0041] The machine in question is advantageously used in the technical field of manufacturing and marketing of industrial printing machines, and in particular for printing on flexible material tapes, particularly plastic, or paper or aluminium or similar.

[0042] The type of machine in question is itself known in the technical jargon of the industry as a flexographic or flexo-printing machines.

[0043] The flexographic machine 1 in question is suitable for use in a flexographic printing plant.

[0044] In more detail, the machine 1 according to the invention is configured to intercept a tape N (visible in the attached figure 2) of material to be printed.

[0045] Advantageously, in accordance with a preferred embodiment of the present invention, the tape N is made of flexible material, in particular plastic material, and is appropriately manipulated by further stations of the plant not illustrated in the accompanying figures and known to the skilled person in the field and therefore not described in detail below.

[0046] Otherwise, in accordance with further design forms, the tape Nis made of paper or aluminium.

[0047] More generally, the tape N of material to be printed can be made of any material suitable to be manipulated by the machine 1 object of the present invention, in particular the tape N is made of flexible material.

[0048] The machine 1 appropriately comprise at least one support structure 2.

[0049] The support structure 2 of the machine 1 is advantageously intended to rest on the ground and is preferably shaped as a protective casing. Preferably, the support structure 2 is made of a metal material. Advantageously, the support structure 2 internally defines a housing volume 23, configured to be traversed by the tape N to be printed.

[0050] In more detail, the support structure 2 comprises a base portion 25, intended to rest on the ground, and side walls 26 that extend transversally from the base portion to laterally delimit the housing volume 23.

[0051] Preferably, the side walls 26 include movable access doors 26' to allow access to the housing volume 23, and easy access to the machine rollers 1.

[0052] For the purpose of printing the tape N to be printed, machine 1 comprises a plurality of rollers, pivotally bound to said support structure and capable of intercepting the tape N.

[0053] In accordance with the design shown in the attached figures, machine 1 is a satellite or planetary type rotary flexographic machine.

[0054] In accordance with this embodiment, the machine 1 preferably comprises at least one feedback roller (also known by the term "contrast roller") 22, which is pivotally attached to the support structure 2 within the housing volume 23 and pivots about a substantially horizontal rotation axis.

[0055] The machine according to the invention further advantageously comprises at least one printing roller 3 rotatably mounted on said support structure 2 and configured to be driven in rotation about a rotation axis X and to be intercepted by a tape N of material to be printed.

[0056] Suitably, the printing roller 3 is mounted adjacent to the feedback roller 22 and preferably the machine 1 comprises a plurality of printing rollers 3 pivotally mounted to the support structure 2 around the feedback roller 22.

[0057] Preferably, feedback roller 22 has a larger diameter than printing rollers 3, so that a plurality of printing rollers 3 can be placed around a single feedback roller 22.

[0058] Appropriately, all of the printing rollers 3 and the feedback roller 22 are pivoted around a corresponding rotation axis parallel to the rotation axis X, identified in the attached figures.

[0059] The tape N to be printed is intended to be moved between the printing rollers 3 and the feedback roller 22.

[0060] Printing rollers 3 are configured to imprint a print on the N tape by pressing a stencil (described in detail below) inked on the N tape itself, with feedback roller 22 acting as a stop and/or end wall during printing.

[0061] Each printing roller 3 is configured to be wrapped by a printing die, known in the technical jargon of the sector as a "clich6", not illustrated in detail in the attached figures and in itself known to the technician of the sector, made of polymeric material and equipped with a protruding rib defining the figure to be printed on the N tape.

[0062] Advantageously, printing roller 3 is equipped with at least one positioner (not shown in detail in the attached figures) that can be operated to move the print roller sideways.

[0063] Appropriately, the positioner comprise a linear actuator configured to translate the printing roller 3 parallel to its rotation axis, preferably by a few millimetres, to compensate for any assembly errors.

[0064] Preferably, the positioner actuator is driven by an electric motor equipped with at least one encoder and a ball screw to ensure its smooth and controlled movement.

[0065] The machine 1 also preferably comprises at least one inking roller 24 arranged side-by-side with the at least one printing roller 3 and is configured to apply a layer of ink on the printing matrix of the printing roller 3

and thus print the figure on the tape N.

[0066] Suitably, the machine 1 comprises a plurality of inking rollers 24, corresponding to the plurality of printing rollers 3. Advantageously, each inking roller is configured to transfer an ink of a different colouring than the other inking rollers.

[0067] Appropriately, the printing roller 3 comprises at least one support core 4 that is swivellingly mounted to the support structure 2.

[0068] The support core 4 is configured to be mechanically connected to the support structure 2. In accordance with the preferred but not limiting embodiment illustrated in the attached figures, the support core 4 is substantially cylindrical in shape.

[0069] Advantageously, the printing roller 3 also comprises at least one tubular element 5 mechanically connected to said core 4 and extending along said rotation axis X.

[0070] Tubular element 5 is known in the industry's technical jargon as the 'sleeve' and is intended to be wrapped around the printing die or plate.

[0071] Suitably, the printing roller 3 comprises connecting means 6 at least partially interposed between said support core 4 and said tubular element 5 and configured to mechanically connect them.

[0072] Advantageously, the connecting means 6 comprise at least one protruding element 7 extending from said support core 4 radially with respect to said rotation axis X and provided with at least two side walls 8 inclined with respect to said rotation axis X.

[0073] Advantageously, the connecting means 6 further comprise at least one housing seat 9 formed on an inner wall of said tubular element 5, configured to accommodate said protruding element 7 of said support core 4 and provided with two stop walls 10 inclined with respect to said rotation axis X and configured to receive in abutment said inclined side walls 8 of said protruding element 7.

[0074] In this way, the connecting means 6 thus shaped of the machine according to the invention allow the tubular element 5 to be mechanically connected to the support core 4 quickly and easily, obviating any risk of misalignment and/or mechanical misalignment between the two said elements.

[0075] In addition, the connecting means 6 thus designed allow for quick and easy alignment of the tubular body 5 on the support core 4.

[0076] In fact, the side walls 8 of the protruding element 7 define a large contact area with the housing seat 9 formed in the tubular body 5, in particular they define at least two separate contact areas, which define a single angular position with respect to the rotation axis X, in particular effectively preventing any mechanical clearance and/or undesired rotation.

[0077] Appropriately, the rotation axis X defines a central plane passing through the protruding element 7. Advantageously, the side walls 8 taper towards this central plane comprising the rotation axis X.

[0078] Advantageously, the protruding element 7 has a substantially prismatic shape, preferably with a trapezoidal base.

[0079] Preferably, protruding element 7 has an essentially isosceles trapezoid shape.

[0080] Appropriately, said protruding element 7 is placed in the proximal of one end 4' of said support core 4.

[0081] Appropriately, the protruding element 7 is provided with at least one transverse wall 27, arranged proximal to the end 4' of the support core 4, from which the side walls 8 develop at an angle.

[0082] In the preferred embodiment illustrated in the attached figures, the protruding element 7 comprises a second transverse wall 27', substantially parallel to the first transverse wall 27 and located distal to the end 4'.

[0083] In more detail, the second transverse wall 27' has a smaller extension than the first transverse wall 27, and are connected to each other at their respective ends by the two inclined side walls 8.

[0084] Advantageously, the transverse walls 27, 27' are provided with tapered edges 28 from which the side walls 8 develop at an angle.

[0085] In accordance with a further embodiment not illustrated in the attached figures, protruding element 7 has a substantially triangular shape and preferably an isosceles triangle.

[0086] Advantageously, the housing seat 9 has an elongated extension and extends between an access opening 11 formed on a perimeter edge 12 of said tubular element 5 and configured to receive said protruding element 7 and a back wall 13 opposed to said access opening 11.

[0087] In accordance with the preferred embodiment illustrated in the attached figures, the stop walls 10 of the housing seat 9 are extended closer to each other from the access opening 11 towards the back wall 13.

[0088] Similarly, the side walls 8 of the protruding element 7 are inclined, preferably towards each other in a congruent manner with the stop walls 10 of the housing seat 9.

[0089] In other words, by defining a direction of insertion of the protruding element 7 into the housing seat 9, the side walls 8 of the protruding element 7 extend closer together with said insertion direction.

[0090] In this way, the stop walls 10 of the housing seat 9 define an inclined profile for the insertion of the protruding element 7, which locks into the housing seat 9 with the side walls 8 substantially abutting the stop walls 10.

[0091] Appropriately, the tubular element 5 is made of plastic material. In order to allow for a stable and durable mechanical coupling, the housing seat 9 is formed in an insert 29 made of metal material bound to an edge of the tubular element 5.

[0092] Appropriately, the protruding element 7 is fixed to an external surface 14 of said support core 4 by means of removable fixing means 15.

[0093] Preferably, the support core 4 comprises at

least one central body 16 configured to be mechanically connected to said support structure 2 and at least one intermediate body 17 mechanically connected to said central body 16.

[0094] The intermediate body 17 is known in industry jargon as the 'carrier' and is configured to mechanically support the tubular element 5, i.e. the 'sleeve'.

[0095] The intermediate body 17 of printing roller 3 is designed to increase the transverse dimensions of printing roller 3 itself in order to allow the use of different sized print matrices.

[0096] Preferably, the intermediate body 17 has a substantially circular cross-section.

[0097] Appropriately, the external surface 14 on which the protruding element 7 is mechanically connected is defined externally to the central body 16.

[0098] Preferably, the external surface 14 is substantially cylindrical and comprise at least one planar portion near the end 4' to which the protruding element 7 is mechanically attached.

[0099] Appropriately, the printing roller 3 of the machine 1 according to the invention comprises second connecting means 18 at least partially interposed between the central body 16 and the intermediate body 17.

[0100] The second connecting means 18 advantageously comprise at least one second protruding element, extending from the central body 16 of said support core 4, radially with respect to said rotation axis X and provided with at least two side walls inclined with respect to said axis X.

[0101] Advantageously, the second connecting means 18 comprise at least a second housing 19 formed on an inner wall of said intermediate body 17 of said support core 4, configured to house said second protruding element and provided with two stop walls inclined with respect to said axis and configured to receive in abutment said inclined side walls of said second protruding element.

[0102] Appropriately, the protruding element 7 is provided with a through-hole 20 extending radially with respect to said X-axis and engaged by a fastening screw 21 engaged by screwing into said support core 4.

[0103] Obviously, the protruding element 7 may be fixed to the support core 4 by any type of removable fixing means 15, which are known to the skilled person in the field, without thereby falling outside the scope of protection of the present patent.

[0104] In this way, the protruding element 7 is removably attached to the support core 4 of the printing roller 3. In this way, the protruding element 7 of the connecting means 6 can be quickly and easily removed and/or replaced.

[0105] Also forming an object of the present invention is a printing roller 3 for a flexographic printing machine of the type described above, of which the same numerical references will be retained for simplicity of exposition.

[0106] Obviously, all features of printing roller 3 described with reference to machine 1 are equally applicable to printing roller 3 as such, whether taken alone or in any combination thereof.

[0107] Printing roller 3 for a flexographic machine 1 is intended to be driven in rotation around an X axis of rotation.

[0108] The printing roller 3 according to the invention comprises at least one support core 4.

[0109] Support core 4 is intended to be pivotally connected to support structure 2.

[0110] The printing roller 3 also appropriately comprises at least one tubular element 5 mechanically connected to said support core 4 and extending along said axis of rotation X.

[0111] The printing roller 3 further advantageously comprises connecting means 6 at least partially interposed between said support core and said tubular element 5 and configured to mechanically connect them.

[0112] In more detail, moreover, the connecting means 6 comprise at least one protruding element 7, extending from said support core 4 radially with respect to said X-axis and provided with at least two side walls 8 inclined with respect to said X-axis and tapering.

[0113] Advantageously, the connecting means 6 further comprise at least one housing seat 9 formed on an inner wall of said tubular element 5, configured to accommodate said protruding element 7 of said tubular element 5 and provided with two stop walls 10 inclined with respect to said rotation axis X and configured to receive in abutment said inclined side walls 8 of said protruding element 7.

[0114] All features described with reference to the machine 1 are to be understood to be described, taken alone or in any combination thereof, also with reference to the printing roller 3 which is also an object of the present invention.

[0115] It is clear from the foregoing that the machine, according to the invention, for flexographic printing and the printing roller for a flexographic printing machine are particularly advantageous in that:

- comprise safe and reliable coupling means between rollers and their sleeves;
- is constructively completely reliable;
- is able to limit maintenance work due to poor mechanical coupling between rollers and their sleeves;
- enables quick and easy assembly of sleeves onto their rollers;
- constructively simple;
- are improved and/or alternative to traditional solutions;
- can be realised easily, quickly and at low cost;
- the roller can also be used in commercially available flexographic printing machines;
- can be realised easily, quickly and at low cost.

[0116] The present invention has been illustrated and described in its preferred form of realisation, but it is understood that variations in execution may be made to it

in practice, without, however, going beyond the scope of protection of this patent for industrial invention.

Claims

1. Flexographic printing machine (1) comprising:

    - at least one support structure (2);
    - at least one printing roller (3) rotatably mounted on said support structure (2) and configured to be driven in rotation around a rotation axis (X) and to be intercepted by a tape (N) of material to be printed;
    said printing roller (3) comprising:

        - at least one support core (4) pivotally mounted to said support structure (2);
        - at least one tubular element (5) mechanically connected to said core (4) and extending along said rotation axis (X);
        - connection means (6) at least partially interposed between said support core (4) and said tubular element (5) and configured to mechanically connect them;

    said connection means (6) comprise:

        - at least one protruding element (7) extending from said support core (4) radially in relation to said rotation axis (X);
        - at least one housing seat (9) formed on an inner wall of said tubular element (5), configured to house said protruding element (7) of said support core (4);

    said machine being **characterised in that**:
    said protruding element (7) is provided with at least two side walls (8) inclined with respect to said rotation axis (X) and said housing seat (9) is provided with two stop walls (10) inclined with respect to said rotation axis (X) and configured to receive said inclined side walls (8) of said protruding element (7) in abutment.

2. Flexographic printing machine according to claim 1, **characterised in that** said protruding element (7) has a substantially prismatic shape with a trapezoidal or triangular base.

3. Flexographic printing machine according to claim 1 or 2, **characterised in that** said protruding element (7) is provided with at least one transverse wall (27), arranged proximal to one end (4') of said support core (4), from which said side walls (8) are inclined.

4. Flexographic printing machine according to claim 3, **characterised in that** said protruding element (7) comprises a second transverse wall (27'), substantially parallel to the first transverse wall (27) and located distal to the end (4').

5. Flexographic printing machine according to claim 4, **characterised in that** said second transverse wall (27') of said protruding element (7) has a smaller extension than said first transverse wall (27);
said first transverse wall (27) and said second transverse wall (27') being connected to each other at their respective ends by said two inclined side walls (8).

6. Flexographic printing machine according to claim 5, **characterised in that** said transverse walls (27, 27') are provided with tapered edges (28) from which the side walls (8) extend at an angle.

7. Flexographic printing machine according to one or more of the preceding claims, **characterised in that** said protruding element (7) is fixed to said support core (4) by means of removable fixing means (15).

8. Flexographic printing machine according to claim 7, **characterised in that** said removable fixing means (15) comprise a through hole (20), which is formed in said protruding element (7), extends radially with respect to said axis (X) and is engaged by a fixing screw (21) engaged by screwing into said support core (4).

9. Flexographic printing machine according to one or more of the preceding claims, **characterised in that** said protruding element (7) is placed near one end (4') of said support core (4).

10. Flexographic printing machine according to claim 9, **characterised in that** said housing seat (9) has an elongated extension and extends between an access opening (11) formed on a perimeter edge (12) of said tubular element (5) and configured to receive said protruding element (7) and a back wall (13) opposed to said access opening (11).

11. Flexographic printing machine according to claim 10, **characterised in that** said stop walls (10) are extending closer together from said access opening (11) towards said back wall (13).

12. Flexographic printing machine according to one or more of the preceding claims, **characterised in that** said support core (4) comprises at least one central body (16) configured to be mechanically connected to said support structure (2) and at least one intermediate body (17) mechanically connected to said central body (16), said outer surface (14) being defined externally to said central body (16).

13. Flexographic printing machine according to claim 12, **characterised by** comprising second connecting means (18) at least partially interposed between said central body (16) and said intermediate body (17) and comprising:

- at least a second protruding element, extending from said central body (16) of said support core (4), radially with respect to said rotation axis (X) and provided with at least two side walls inclined with respect to said axis (X);
- at least a second housing (19) formed on an internal wall of said intermediate body (17) of said support core (4), configured to house said second protruding element and provided with two stop walls inclined with respect to said axis and configured to receive in abutment said inclined side walls of said second protruding element.

14. Printing roller (3) for a flexographic printing machine (1), intended to be rotationally driven around a rotation axis (X) and comprising:

- at least one support core (4);
- at least one tubular element (5) mechanically connected to said support core (4) and extending along said rotation axis (X);
- connection means (6) at least partially interposed between said support core and said tubular element (5) and configured to mechanically connect them;

these connection means (6) comprise:

- at least one protruding element (7), extending from said support core (4) radially in relation to said axis (X);
- at least one housing seat (9) on an inner wall of said tubular element (5), configured to house said protruding element (7) of said tubular element (5); said printing roller (3) being **characterised in that** said protruding element (7) is provided with at least two side walls (8) inclined with respect to said axis (X) and tapering, and said housing seat (9) is provided with two stop walls (10) inclined with respect to said rotation axis (X) and configured to receive said inclined side walls (8) of said protruding element (7) in abutment.

15. Printing roller (3) according to claim 14, **characterised in that** said protruding element (7) is fixed on said support core (4) by means of removable fixing means (15).

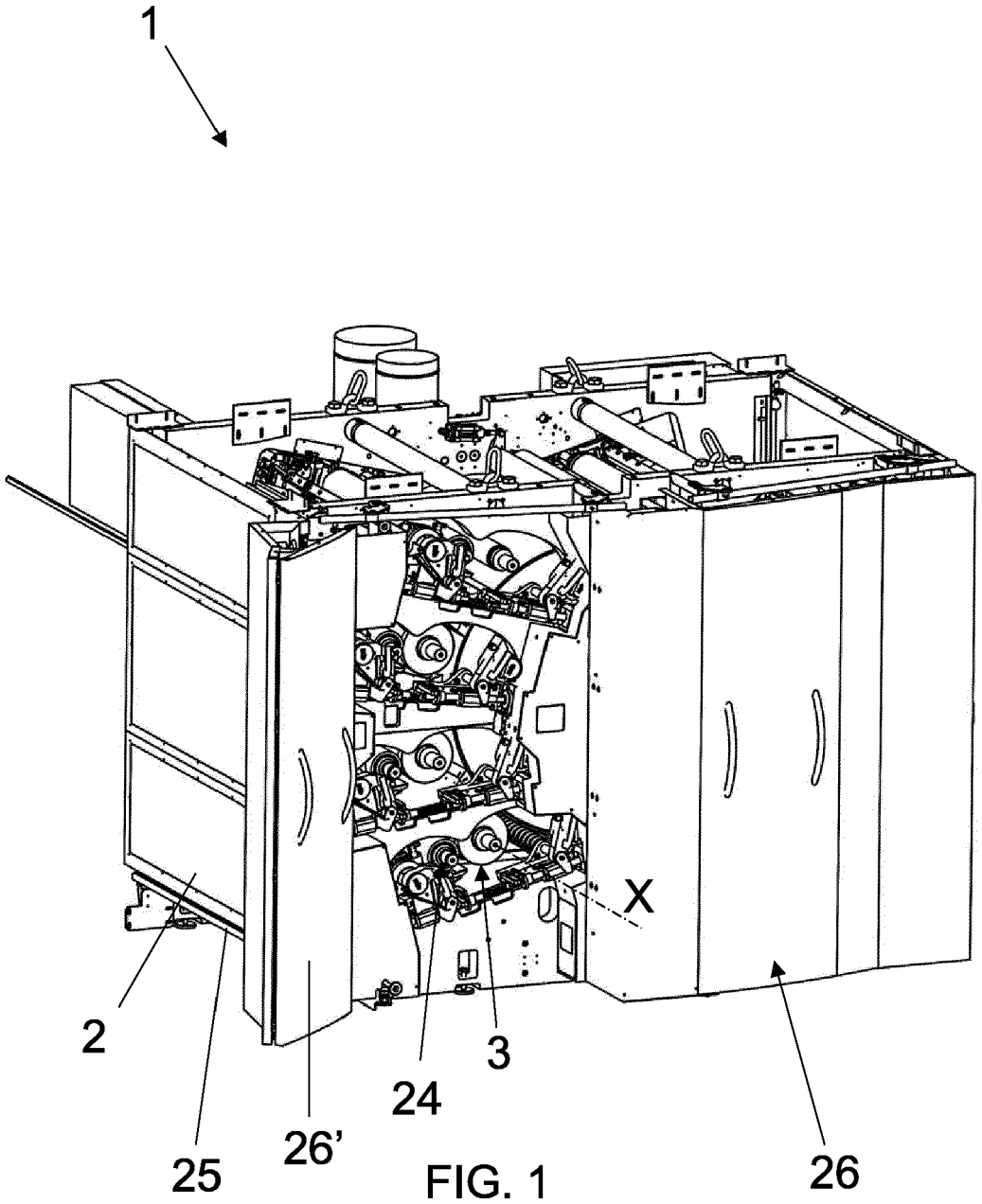

FIG. 1

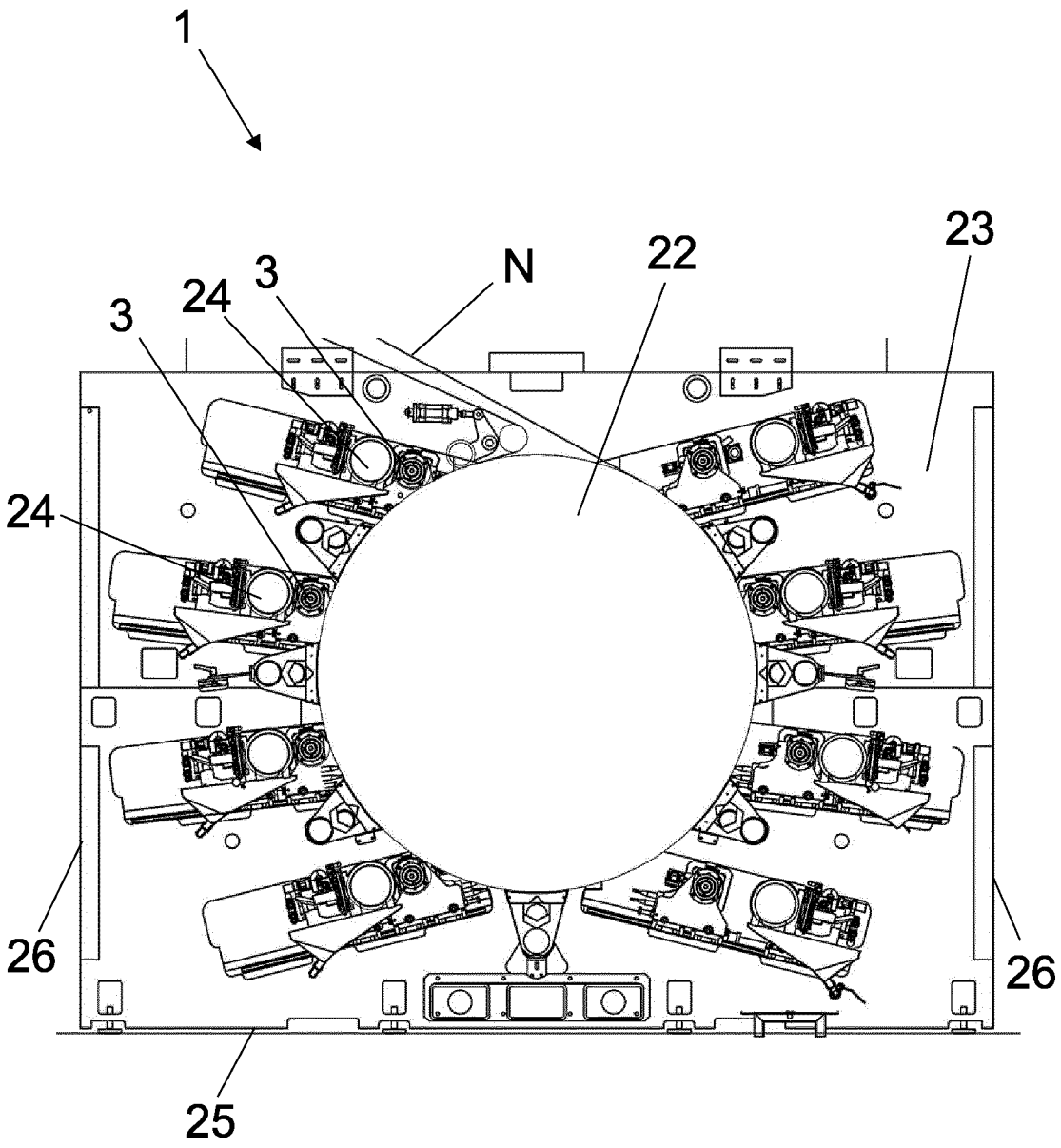

FIG. 2

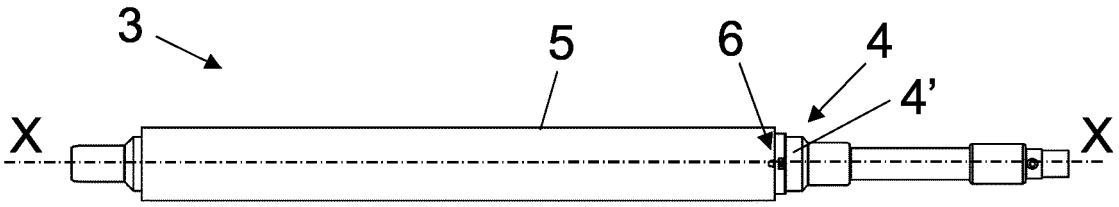

FIG. 3

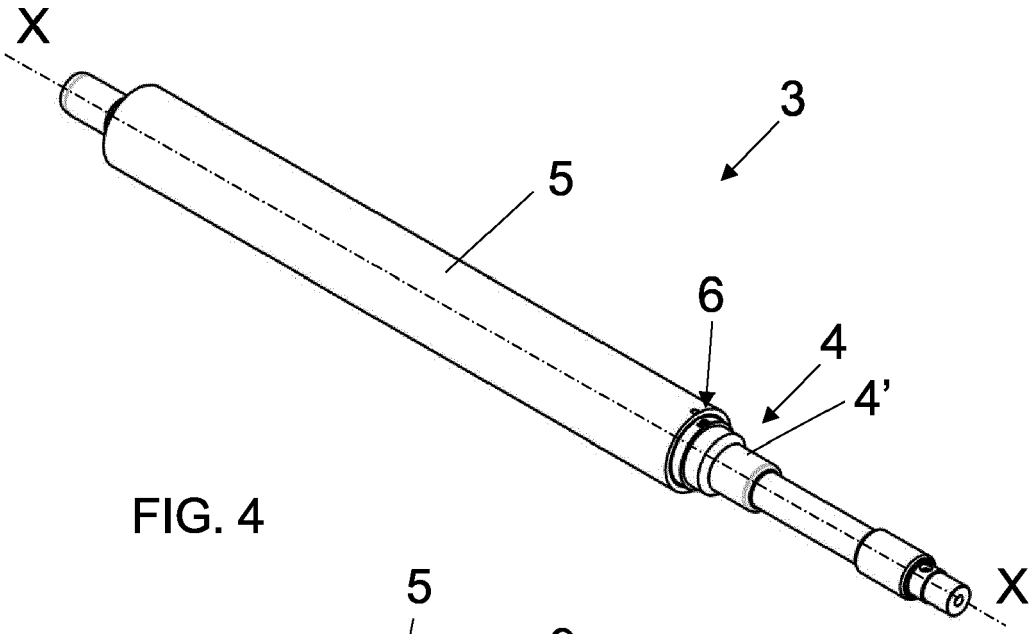

FIG. 4

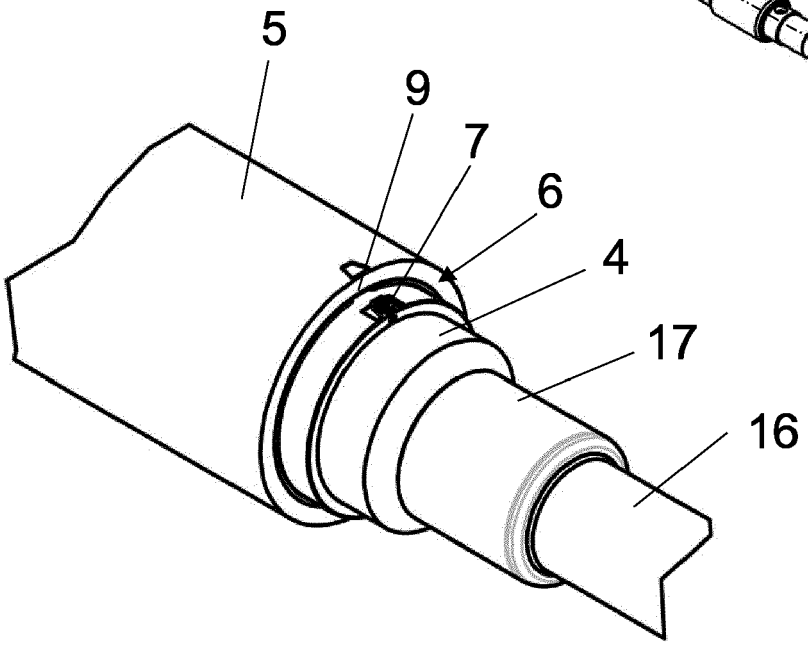

FIG. 5

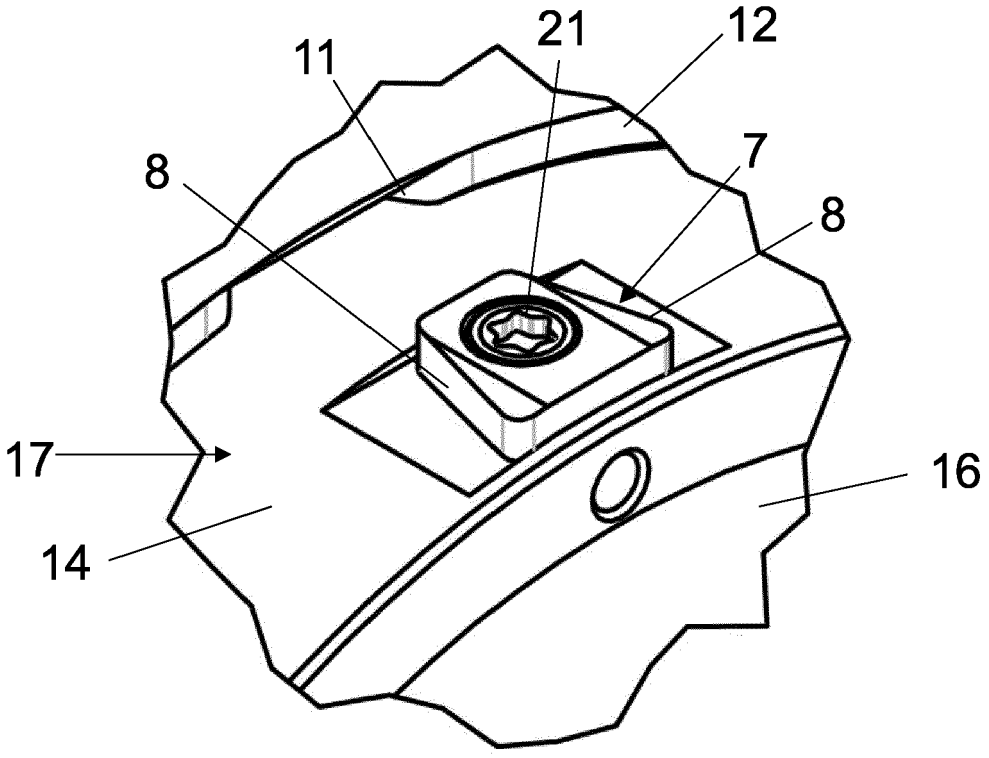

FIG. 6

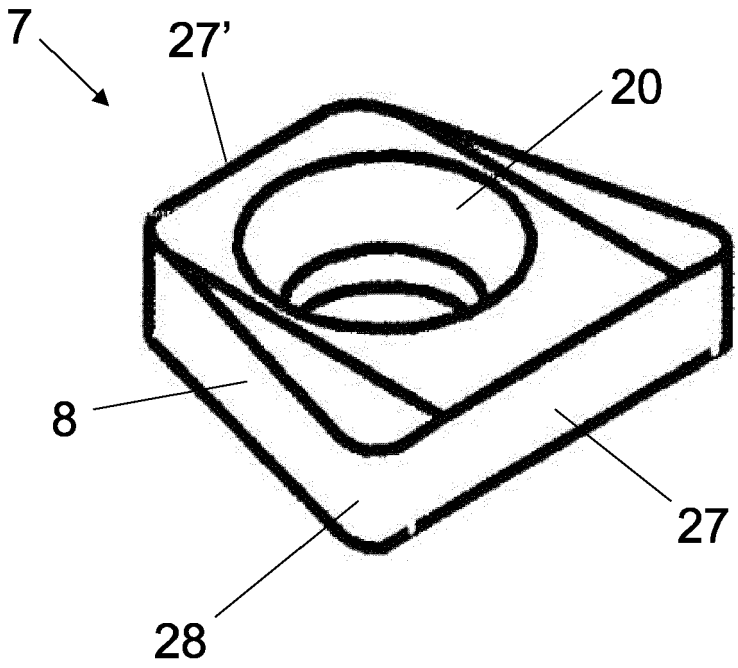

FIG. 7

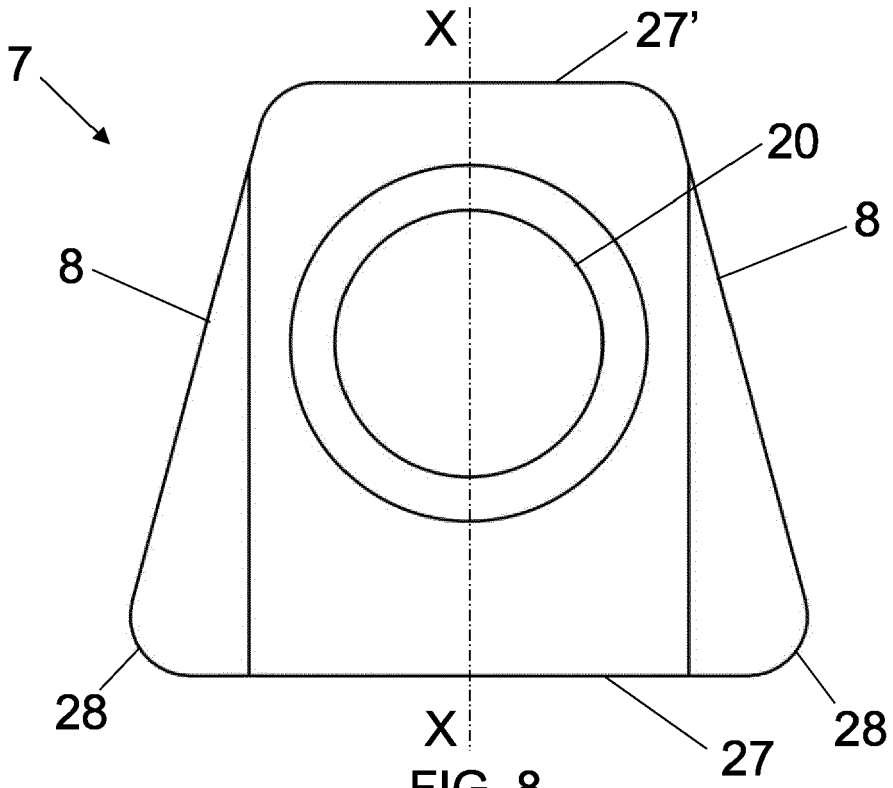

FIG. 8

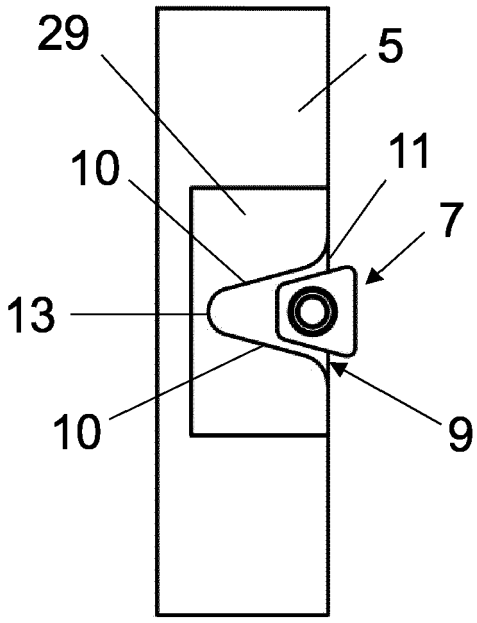

FIG. 9

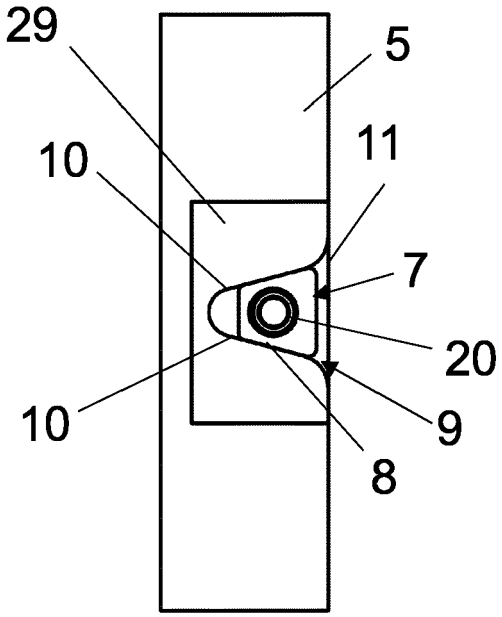

FIG. 10

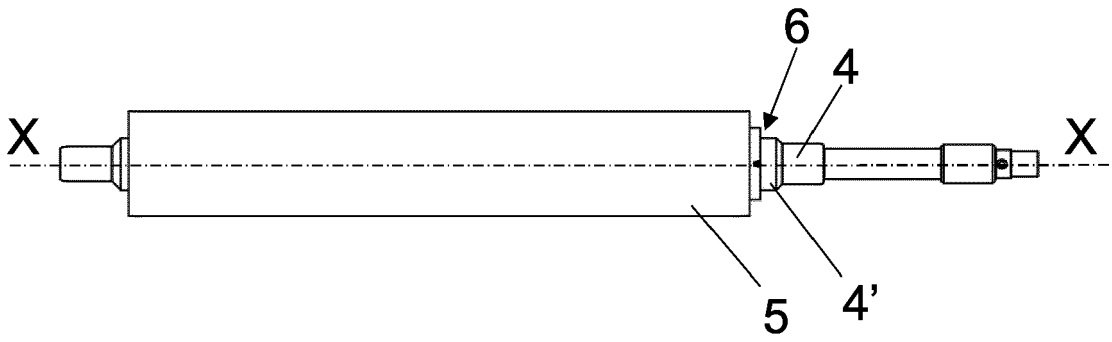

FIG. 11

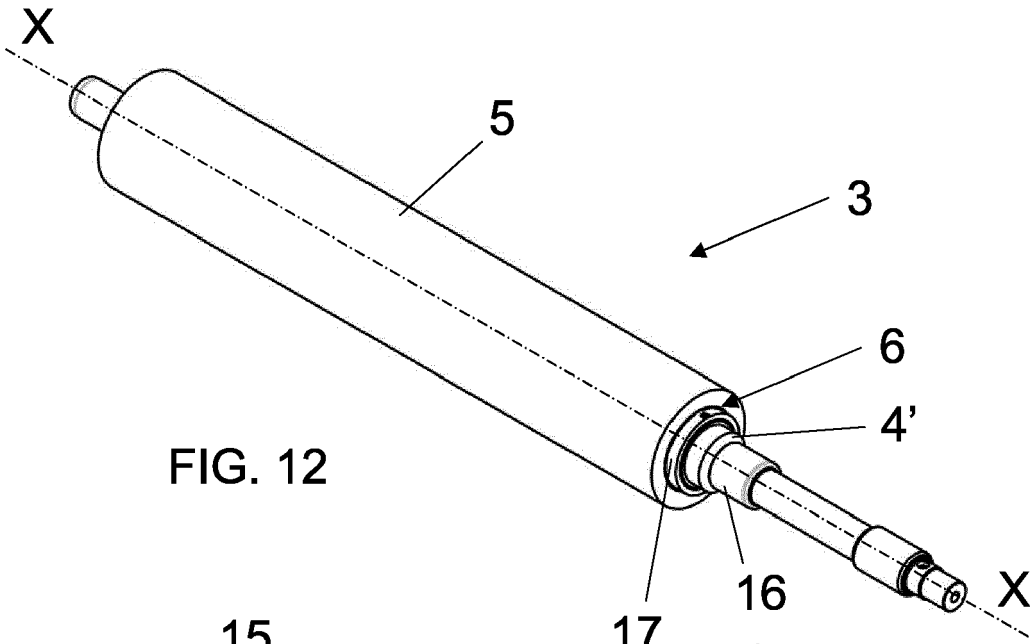

FIG. 12

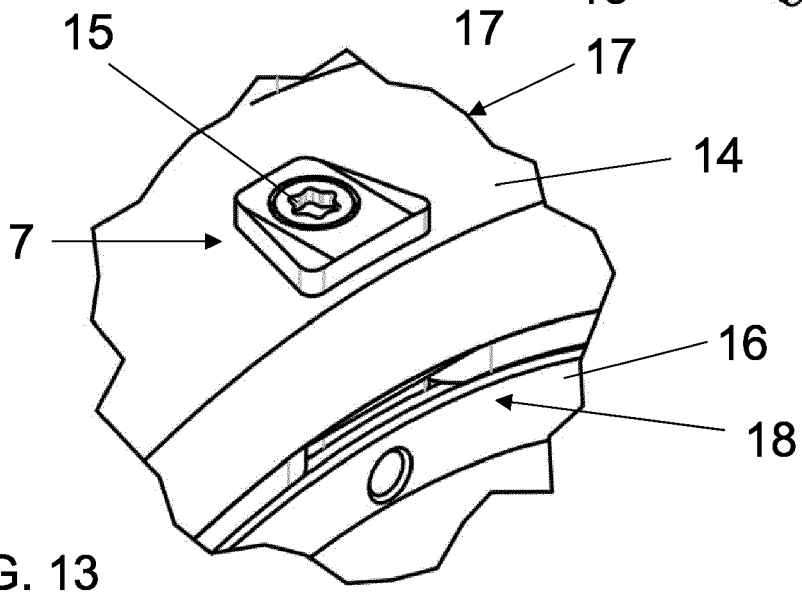

FIG. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 22 17 5668

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2017/008269 A1 (HONDA NAOTO [JP]) 12 January 2017 (2017-01-12) * paragraphs [0003], [0032] - paragraph [0061]; claims 1-4; figures 2,4,5 *	1-15	INV. B41F13/16 B41F27/12
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A	EP 0 711 664 A1 (ROLAND MAN DRUCKMASCH [DE]) 15 May 1996 (1996-05-15) * column 1, line 6 - line 14; claims 1-9; figures 1-7 * * column 3, line 13 - column 5, line 14 *	1-15	
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			B41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 August 2022	Durucan, Emrullah

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