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(54) **Inking device for a printing machine**

(57) There dips into an ink reservoir 2 associated with a plate cylinder 1 a driven ink reservoir roller 3, of which the speed of rotation is adjustable. The ink reservoir roller 3 has a porous jacket 4 and a driven doctor roller 9, 10 is pressed against the ink reservoir roller under substantially constant pressure, the value of which may be varied by means of an adjusting device 15 to 18. The jacket 4 is preferably uniformly permeated by small, non-communicating pores, of which the outer layer opens outwardly and may be of ink-receptive foamed plastics. The diameter of the doctor roller 9, 10 may be slightly less than one fifteenth of the diameter of the ink reservoir roller. The ink reservoir roller 3 can supply ink to the plate cylinder 1 by means of rollers 24, 25, or may directly contact the cylinder 1. Various means may be employed to vary the pressure of the doctor roller.

Fig.1

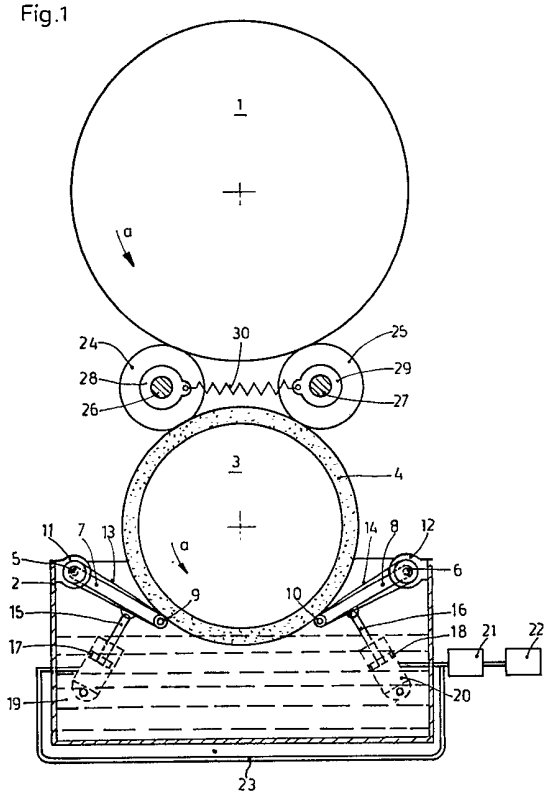

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Fig.1

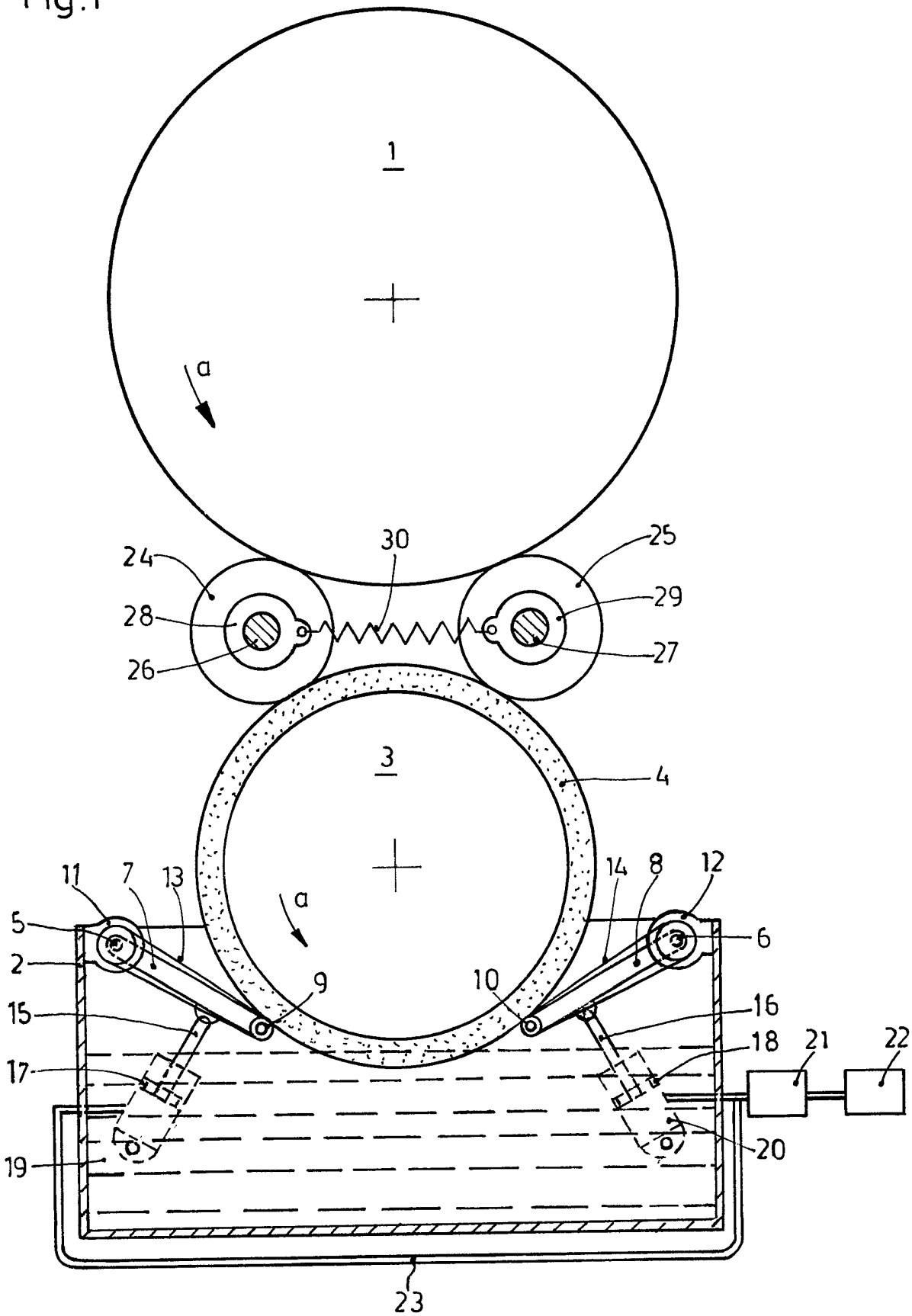
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Fig. 2

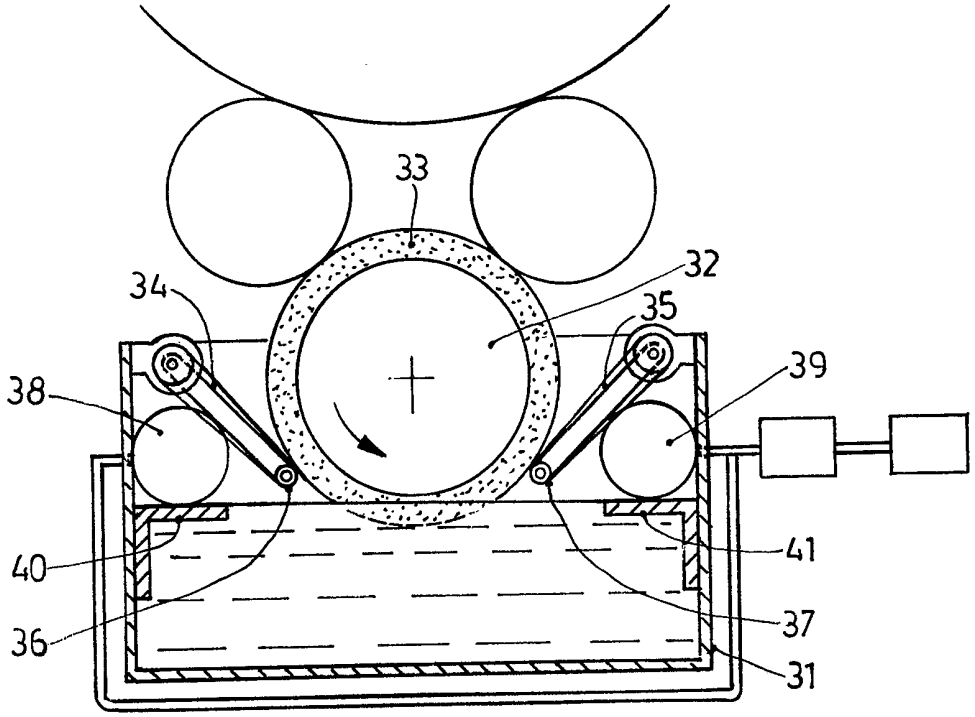

Fig. 3

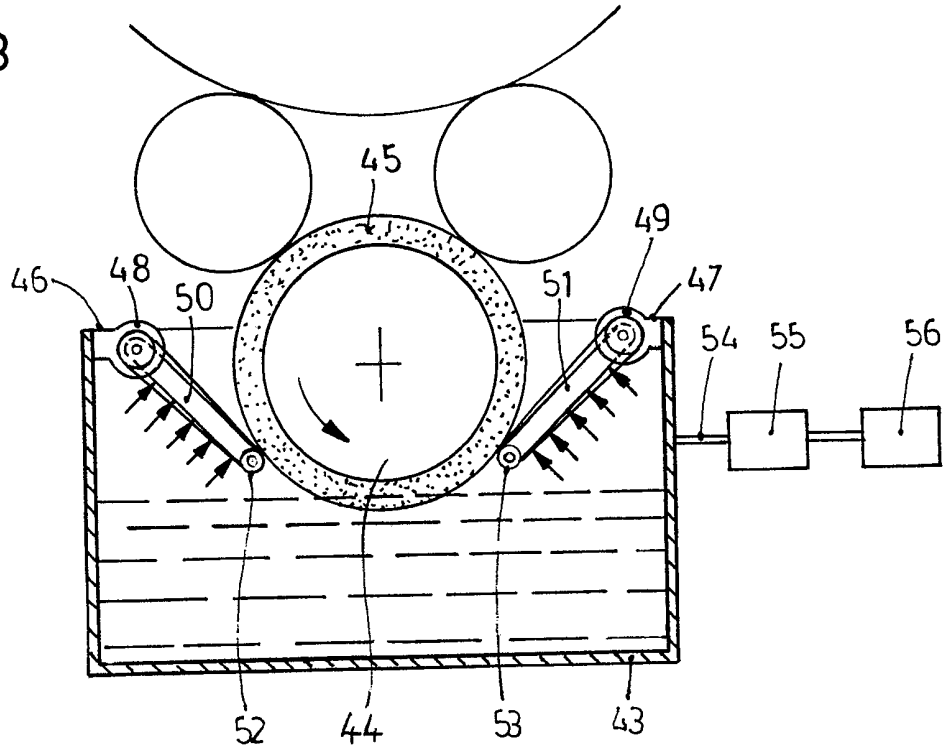

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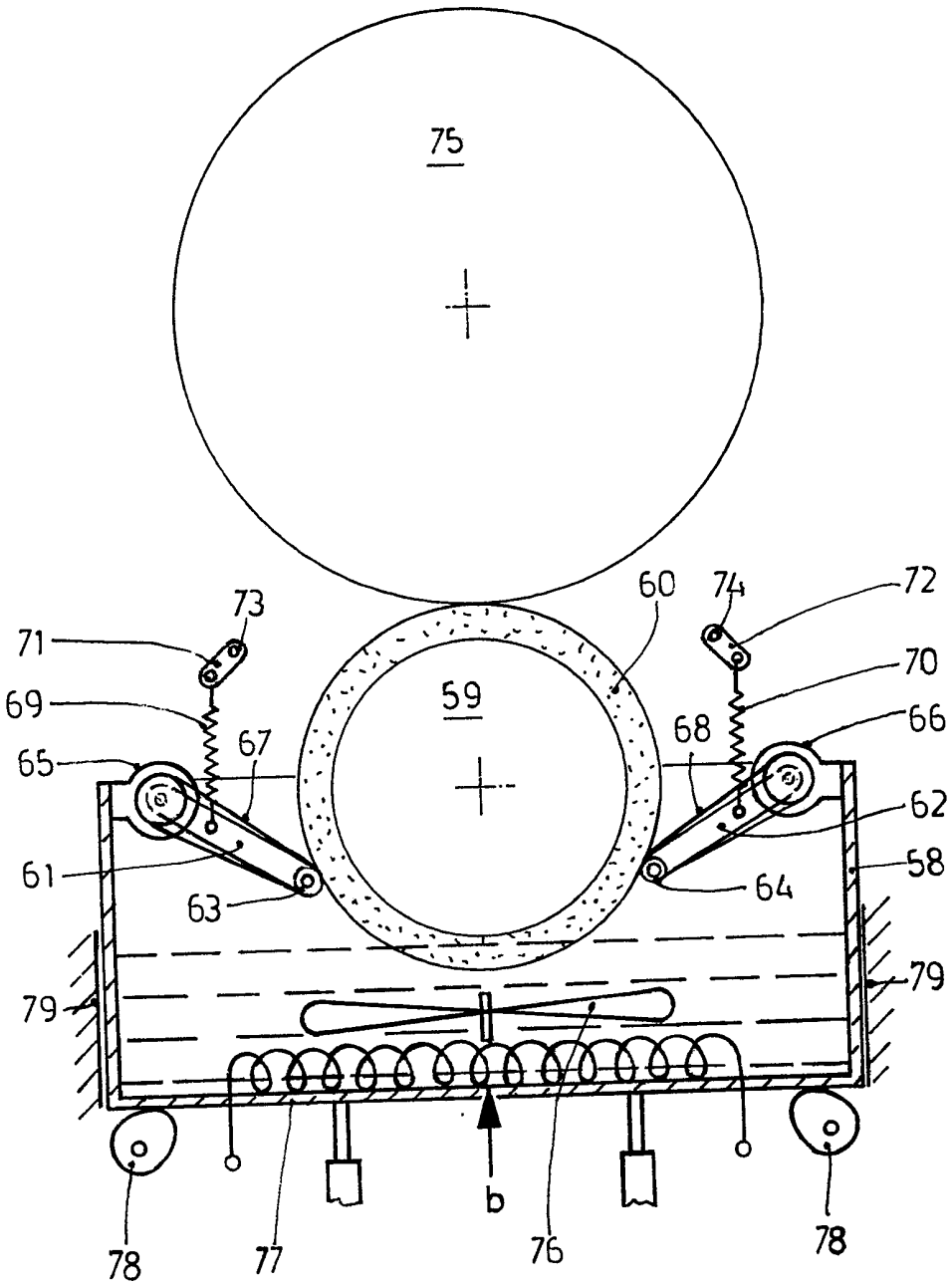
Fig. 4



SPECIFICATION

Inking device for a printing machine

The invention relates to an inking device for a printing machine.

There is disclosed in United States Patent Specification No, 3,585, 932 an inking device for an offset or relief printing machine, comprising an ink reservoir, an ink reservoir roller which partially dips into the ink in the ink reservoir and of which the surface has outwardly opening pores, and an adjustable doctor for the ink reservoir roller. The ink reservoir roller has a metallic surface into which outwardly opening pores are etched, and co-operates with a plastic doctor whose end closer to the ink reservoir roller is profiled. The necessary etching of the surface of the ink reservoir roller is an appreciable factor in the cost of manufacture. In addition, the doctor is subject to wear and, owing to the profiling which is essential to its function, can only be readjusted within narrow limits, so that it must be replaced when wear has taken place.

The present invention aims to provide a genrally improved inking device.

According to the prsent invention, there is provided an inking device for a printing machine, the device comprising an ink reservoir, an ink roller which is positioned to dip partially below the level of ink in the reservoir and has a surface which has outwardly opening pores, a driven doctor roller which is urged against the ink roller with a substantially constant force, and means for adjusting the value of said force.

At least in preferred embodiments of the invention the ink roller may be produced at low cost, and both the ink roller and the doctor roller may undergo scarcely any wear. Should a small amount of wear nevertheless occur, it should not affect the printing, owing to the constant pressing force of the doctor, which ensures a uniform supply of ink.

To assist in understanding the inventio and to show how it may be carried out, some embodiments thereof will now be described, by way of example, with reference to the accompanying drawings, in which Figures 1 to 4 diagrammatically illustrate in side elevation respective embodiments of the invention.

The inking device illustrated in Figure 1, for supplying ink to a plate cylinder 1, comprises an ink reservoir 2. A driven ink reservoir roller 3 dips slightly into the ink in the ink reservoir 2. The speed of rotation of the ink reservoir roller 3 is adjustable. In addition, there are provided means known *per se* (not shown) which impart a reciprocating traversing motion to the ink reservoir roller 3. The latter comprises a jacket 4 consisting of an ink-receptive foamed plastics material. The jacket is accordingly uniformly traversed by small, uniformly distributed, non-communicating pores, of which the outer layer opens outwardly. Should the jacket 4 become worn, the depth of roughness, the pore spacing and diameter and the hardness of its surface are maintained. Since the pores do not communicate with one another, the ink cannot penetrate, so that brief variations of the quantity of ink applied to the plate cylinder 1 may occur.

Adjusting levers 7, 8 are rockably mounted on fixture pins 5,6 on the ink reservoir 2. A doctor roller 9 whose surface consists of metal or plastics is held at each end by means of a respective adjusting lever 7. Likewise, a doctor roller 10 is disposed between two adjusting levers 8. Each doctor roller is driven by means of an electric motor 11, 12, which is also secured to the ink reservoir 2, and by means of a belt drive 13, 14. There may be provided instead of a belt drive another drive, for example by way of shafts with bevel wheels. The doctor rollers 9, 10 rotate at very low surface velocity as compared with the surface velocity of the ink reservoir roller 3. In the same way as the ink reservoir roller 3, the doctor rollers 9, 10 are additionally driven with a traversing motion in the direction of the axis, the traversing movements of the ink reservoir roller 3 on the one hand and of the doctor rollers 9, 10 on the other hand being inverse in relation to one another. There are desirably provided over the width of the plate cylinder 1 a number of separate doctor rollers 9, 10 to enable the inking to take place sidewise, *i.e.* over the width of a plate.

In addition, there are pivotally connected to the adjusting levers 7, 8 adjusting rods 15, 16 which are fixedly connected to pistons 17, 18. The pistons slide in adjusting cylinders 19, 20, which in turn are pivotally connected to the ink reservoir 2 and to which a fluid under pressure, for example, compressed air or an hydraulic liquid, can be supplied through ducts 23. The pressure of the fluid is adjustable by means of a pressure-regulating valve 21 which is connected to a pressure generator, for example, a pump 22. By variation of the pressure, the pressing force of the doctor rollers 9, 10 on the ink reservoir roller 3, and hence the thickness of the layer of ink supplied to the plate cylinder, is varied.

For the transfer of the layer of ink from the ink reservoir roller 3 to the plate cylinder 1, there are provided two ink transfer rollers 24, 25, which may either be driven by friction or by means of a separate adjustable drive. Each of the two ink transfer rollers 24, 25 has at both ends journals 26, 27 engaging in self-aligning bearings 28, 29. In the ilustrated embodiment, two opposite bearings 28, 29 are for this purpose respectively connected by means of a tension spring 30. Alternatively, the bearings 28, 29 and hence the ink-applying rolls 24, 25 may be guided in relation to one another by means of adjusting cylinders.

In the described inking device, the two doctors which each comprise an adjusting lever 7, 8 and a doctor roller, 9 10 are disposed symmetrically about a plane extending through the axes of the plate cylinder and of the ink reservoir roller. The ink transfer rolls 24, 25 are also mounted symmetrically about this plane. Such a design affords the advantage that the inking device can be operated in two directions of rotation. If this is not necessary, it would be possible to omit, for example, the doctor comprising the lever 7 and the doctor roller 9, as well as the ink transfer roller 24.

When the plate cylinder 1, or the ink reservoir roller 3, rotates in the direction of the arrow *a*, the doctor roller 10 is applied against the ink roller 3 by means of the adjusting cylinder 20, and the electric motor 12 is started for driving the doctor roller 10. The doctor roller 9 may also be applied and driven, but this is not essential. Owing to the rotation of the doctor rollers 9, 10 in the applied condition, they cannot become unilaterally worn, so that the form of the contact surface between the ink reservoir roller 3 and the doctor roller 10 is always maitained unaltered. The force with which the doctor rollers 9, 10 are engaged may either be set manually or it may be set by means of a densimetric measuring device which determines the ink covering of a printed sheet, or a measuring instrument which determines the thickness of the layer of ink on the ink reservoir roller 3 beyond the doctor, as seen in the direction of rotation. Depending upon the strength of the application of the doctor rollers 9, 10 to the ink reservoir roller 3, therefore, the thickness of the layer of ink to be applied by the ink reservoir roller 3 can be varied, ink remaining only in the pores in the extreme case. The ink is thereafter further conveyed in a manner known *per se* to the plate cylinder 1 by way of the transfer rollers 24, 25.

The embodiment illustrated in Figure 2 again shows an ink reservoir 31 into which there dips an ink reservoir roller 32 having a plastics jacket 33 formed with outwardly opening pores. In contrast to the arrangement according to Figure 1, there are employed in this arrangement, for acting on doctor rollers 36, 37 mojnted on adjusting levers 34, 35 flexible hose sections 38, 39 which bear against the inside wall of the ink reservoir 31 and carriers 40, 41 secured thereto. Depending upon the choice of the pressure under which pressure fluid is introduced into the hose sections 38, 39, the force with which the doctor rollers 36, 37 are pressed on to the ink reservoir roller 32 is varied.

In the embodiment illustrated Figure 3, there is employed an ink reservoir 43 which is constructed as a pressure vessel and into which there again dips an ink reservoir roller 44 having a foamed plastic jacket 45. Along the two edges 46, 47 of the ink reservoir 43 which extend parallel to the ink reservoir roller 44 and which bound the aperture for the latter, two throughgoing shut-off flaps 50, 51 are each rockably monted on a pin 48, 49. Soft packings (not particularly shown) are disposed on the end faces of the shut-off flaps 50, 51 and on the ends of the ink reservoir roller 44. A respective doctor roller 52, 53 is rotatably mounted on the free end of each of the two shut-off flaps 50, 51. Packings are provided both on the mounting of the shut-off flaps 50, 51 on the ink reservoir 43 and on the mounting of the doctor rollers 52, 53. There opens into the ink reservoir 43 a duct 54 which communicates with the pressure fluid source 56 by way of a pressure-regulating valve 55.

In this arangement, the pressure force for the doctor rollers 52, 53 is supplied by the adjustable internal pressure of the fluid which is supplied through the duct 54 and which acts on the inside surface of the shut-off flaps 50, 51.

The embodiment illustrated in Fgiure 4 shows an even more simplified inking device. There is here again provided an ink reservoir 58 having mounted thereon an ink reservoir roller 59 which has a jacket 60 consisting of foamed plastics and dips slightly into the ink in the reservoir 58. There are again rockably mounted on the ink reservoir 58 adjusting levers 61, 62 having doctor rollers 63, 64 monted on their free ends. The doctor rollers 63, 64 are adapted to be driven by means of electric motors 65, 66 and belt drives 67, 68.

For producing a constant pressing force in this form of construction, there are employed springs 69, 70 engaging at one end with the adjusting levers 61, 62 and at the other end with adjustable abutments 71, 72. The abutments 71, 72 are constructed as levers rotatably mounted on fixed pins 73, 74 and adapted to be fixed in the position in which the desired pressing force is supplied.

In this form of construction, the ink reservoir roller 59 directly applies the ink to a plate cylinder 75. In order to produce completely constant conditions in regard to the consistency of the ink, there is disposed in the ink reservoir a stirrer 76 and/or a heating means 77. By means of the stirrer 76 or the heating means 77, a desired viscosity of a thixotropic ink may be set. The speed of rotation of the stirrer 76, or the temperature of the heating means 77, can be adjusted by means of a layer thickness measuring instrument, which measures the thickness of the layer of ink on the ink reservoir roller 59, or by means of a measuring instrument which measures the ink covering of a printed sheet.

In order to produce the necessary pressing force between the ink reservoir roller 59 and the plate cylinder 75, the ink reservoir 58 is so mounted as to be adjustable as a whole by means of adjusting cams 78 in fixed guides 79, in the direction of the arrow *b* or in the opposite direction thereto.

CLAIMS

1. An inking device for a printing machine, the device comprising an ink reservoir, an ink roller which is positioned to dip partially below the level of ink in the revervoir and has a surface which has outwardly opening pores, a driven doctor roller which is urged against the ink roller with a substantially constant force, and means for adjusting the value of said force.

2. An inking device according to claim 1, wherein the diameter of the doctor roller is less than one fifteenth of the diameter of the ink roller.

3. An inking device according to claim 1 or 2, wherein each end of the doctor roller is mounted on a respective adjusting lever rockably mounted on the ink reservoir.

4. An inking device according to any preceding claim, wherein said adjusting means comprises a cylinder adapted to be actuated by a pressure fluid medium.

5. An inking device according to any preceding claim, wherein said adjusting means comprises at least one flexible hose and means for adjusting the pressure therein.

6. An inking device according to any preceding

claim, wherein said adjusting means comprises a spring, of which one end is secured to an adjustable abutment.

7. An inking device according to claim 1 or 2, wherein the ink reservoir is constructed as a pressure vessel into which there can be introduced a gaseous fluid of adjustable pressure, the pressure vessel having an aperture for the ink roller, which aperture is partially defined by two flaps which extend along the edges of the ink roller parallel thereto, and the doctor roller being mounted on one of said flaps.

8. An inking device according to any preceding claim, wherein two doctor rollers are disposed substantially symmetrically about the ink roller.

9. An inking device according to any preceding claim, wherein there are provided, substantially symmetrically about the ink roller, two ink-transfer rollers for transferring ink to a plate cylinder.

10. An inking device according to any one of claims 1 to 8, wherein the ink roller is itself adapted to transfer ink to a plate cylinder.

11. An inking device according to any preceding claim, wherein a heating means is provided in the ink reservoir.

12. An inking device according to any preceding claim, wherein a stirrer is provided in the ink reservoir.

13. An inking device according to any preceding claim, wherein the ink roller has a jacket of foamed plastics material formed with said pores.

14. An inking device substantially as hereinbefore described with reference to Figure 1, 2, 3 or 4 of the accompanying drawings.

15. An offset or relief printing machine having an inking device according to any preceding claim.

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