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(54) **Multicolour web printing press**

Mehrfarbenrollendruckmaschine

Presse polychrome à bobines

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Description

[0001] The present invention relates to a printing press provided with a multiplicity of printing assemblies, for example four or more, each assembly comprising a plate-carrying cylinder to which is applied at least one printing plate, and an inking cylinder.

[0002] The invention relates to a printing press according to the preamble of claim 1. Such a press is known from US-A-5,692,442.

[0003] A further printing press with a plurality of printing assemblies, wherein the printing plate of each assembly can axially be registered is disclosed in DE-C-24523.

[0004] The printing press may be of the central-drum type or even of the type with independent cylinders, the so-called "stack", i.e., of the type in which each printing assembly is provided with its own counter-roller about which the printing substrate passes.

[0005] The object of the present invention is to bestow on said printing presses a greater versatility, in particular for printing substrates of considerable width, for example 2600 mm, like the ones made of plastic film designed for forming protective wrappings for mattresses or other voluminous articles. In such cases, the possibility is required of printing said substrates in longitudinal bands of different widths, with different pitches and/or colours. *This object is achieved with a printing press including the features of claim 1.*

[0006] In a printing press according to the invention, at least one of the printing assemblies has the plate cylinder and the inking cylinder with a width substantially smaller than that of the printing counter-roller, and said at least one printing assembly is positionable in any position along the axis of the printing counter-roller by individual means for lateral displacement. The length of the plate cylinders and of the inking cylinders of said at least one printing assembly may also be approximately a sub-multiple of the length of the corresponding printing counter-roller.

[0007] In a preferred embodiment of the invention, for each printing assembly there are provided means for synchronization between the rotation of the plate cylinder and the inking cylinder on the one hand, and the rate of advance of the substrate that is to be printed on the other. A printing plate having a length smaller than or equal to that of the circular development of the plate cylinder may be applied to the cylinder. Alternatively, there may be applied simultaneously to said plate cylinder two plates set one behind the other according to the peripheral development of the cylinder. With the above arrangement, by cyclically stopping for a pre-set time, or anyway varying periodically the speed of rotation of the various plate cylinders while their plates are not in contact with the substrate that is to be printed, it is possible to print longitudinal bands of the substrate with one or more printed patterns, repeated or alternated with pitches that are altogether independent from one band to another. Conveniently, where possible, and especially for printing

pitches that are relatively long, the plate cylinder is cyclically stopped with the plate immediately upstream of the inking cylinder so that the next print will be carried out with fresh ink; i.e., inking of the plate takes place immediately before printing.

[0008] There is thus made available, for printing on the same substrate in a single pass, a considerable number of printing combinations, for bands set alongside one another, or else completely or partially overlapping one another, of repeated printing patterns, which may possibly be alternated, even with a number of colours. In addition, the reduced length of the plate cylinder and of the inking cylinder means that they have a smaller inertia, which is a fact that enables greater precision of control of rotation of the cylinders, and hence also a better printing quality.

[0009] In a preferred embodiment of the invention, the means for lateral displacement of each printing assembly comprise a motor reducer provided with an encoder actuating a screw that works in conjunction with a nut screw, said screw being rotatably supported on one side by a side frame of the press, and the nut screw being fixed to one side of the printing assembly. The encoder is connected to a central control unit by means of which pre-set displacements are obtained with detection of the position reached by the printing assembly along the axis of the corresponding counter-roller.

[0010] The aforesaid means of synchronization between the plate cylinder and the inking cylinder on the one hand, and the advance of the printing substrate on the other may include: an encoder and a variable-speed motor coupled to each assembly that is made up of a plate cylinder and an inking cylinder; a variable-speed motor equipped with an encoder designed to rotate, via a transmission, the printing counter-rollers and to cause there through the advancement of the substrate that is to be printed; and means for driving rotation of said motors designed to receive the signals emitted by said encoders and to adjust individually the speed of the assembly made up of the plate cylinder and the inking cylinder according to the rate of feed of the substrate to be printed and the printing pitch required, as will be described in greater detail in what follows.

[0011] In addition, by locating a photo-electric cell - designed to detect passage of a pre-printed reference mark on the substrate - along the path of the substrate and in a position corresponding to a printing assembly, it is possible to add, on a pre-printed substrate, further printing patterns positioned with sufficient precision with respect to said reference mark. In this way, with the press according to the invention it is possible, for example, to replace bar codes or other markings already printed on the substrate that are outdated with other more up-to-date ones.

[0012] In printing presses, for each printing assembly it must be possible to adjust the pressure between the counter-roller and the plate cylinder, and the pressure between the inking cylinder and the plate cylinder, and this is normally achieved by means of eccentric sleeves

for supporting the rolling bearings of the counter-roller and inking cylinder. In general, prior to start of printing, said eccentric sleeves may be rotated manually to move the counter-roller and the inking cylinder up to or away from the plate cylinder. The above operation, especially in printing presses with a lot of printing assemblies, is a long and laborious one. In a preferred embodiment of the invention, each of said eccentric sleeves is integral with the wheel of a corresponding wheel-and-wormscrew device, the screw of which can be driven by means of a respective motor reducer equipped with an angular-rotation detector - such as a potentiometer or an encoder - connected to an electronic control unit of the motor reducer. In this way, it is possible, via programming, to bring together said counter-roller and said inking roller with the plate cylinder, and to vary the contact pressure between them.

[0013] The inking cylinder of each printing assembly is normally supplied with ink by means of a tray set underneath the inking cylinder and partially filled with ink, said cylinder being partially immersed in the ink. According to the invention, the level of ink in the tray is kept constant by connecting thereto a sealed ink reservoir which communicates with the atmosphere only by means of an outlet of a pipe connecting the reservoir to the tray, for flow of ink into the tray. The level of ink in the tray can be varied by displacing said outlet vertically by means of an eccentric cam, and the connecting pipe is preferably at least in part flexible in order to enable displacement of the ink reservoir to a position below the level of the tray, so as to enable emptying of the residual ink without any risk of spilling, for instance in order to carry out change of colour of the ink or during press maintenance operations.

[0014] Preferably, the tray for inking the inking cylinder is suspended from the latter by means of rotating bearings that are coaxial with the cylinder itself, and set between the tray and said bearings is a pneumatically driven mechanism for bringing the tray up to the cylinder, or else for moving the tray away from the inking cylinder in a radial direction at the end of printing. In this way, the displacements of the inking cylinder to bring it up to the plate cylinder and to vary the pressure between the above two cylinders do not affect the position of the tray with respect to the inking cylinder, and hence the degree of inking of the inking cylinder, in so far as, in its lateral movement the inking cylinder draws along with it also the tray. In addition, by means of said pneumatically driven mechanism, inking can be interrupted or activated according to a program.

[0015] The press according to the invention is particularly suited for printing a substrate made of plastic film coming out of an extruder or other delivery device. In particular, it can be equipped with supporting rollers to facilitate its displacement along guides set in the floor so that it can pass from one extruder to another of a battery of extruders.

[0016] A better understanding of the present invention

will be obtained from the ensuing description and from the attached drawing, which illustrates a non-limiting example of embodiment of the invention. In the drawing

Fig. 1 is a schematic side view of a printing press according to the invention;

Fig. 2 is a partial front view according to the line II-II of the press in Fig. 1;

Fig. 3 is an enlarged partial side view of a printing assembly of the press, according to the cross section taken along the line III-III of Fig. 2;

Fig. 4 is an enlarged partial view of a detail of the press, taken along the line IV-IV of Fig. 1;

Fig. 5 is a view according to the cross section taken along the line V-V of Fig. 4;

Figs. 6, 7 and 8 show diagrams of use of plates in a printing assembly; and

Fig. 9 is a schematic illustration of a printing configuration obtained with the press according to the invention.

[0017] The printing press which will be described in what follows is particularly designed for printing a plastic laminar substrate obtained by extrusion and suitable for packaging of various articles, also including voluminous ones, such as mattresses. With reference to Figs 1 and 2, the press comprises four printing assemblies 1, 3, 5, 7 applied to a structure 9 that comprises two side frames 11, which are rigidly connected together by a first set of tubular cross members 13 (Fig. 1) internally connected by flanges to the side frames, and by a second set of cross members 14 in the form of plates having a rectangular section, each of said plates being secured, by means of screws, on the edges of the side frames 11 in a position corresponding to a printing assembly. The frames 11 rest on the floor on a pair of metal guides 15, 17 with development orthogonal to the frames 11 by means of corresponding idler rollers 19, 21, each of which has a horizontal axis of rotation lying in a vertical plane parallel to the frame. The roller 21 has a constant diameter and rests on a plane guide 17, whereas the roller 19 has a central part of reduced diameter with end flanges designed to withhold the press in a direction orthogonal to the guides, the central part of the roller resting on one part in relief of the guide 15. In this way, the printing press can be easily translated sideways in spite of its considerable weight, in order to print a laminar substrate 23 coming out of any one of a series of extruders.

[0018] The dashed line in Fig. 1 indicates a possible path of the printing substrate 23 traversed by the said substrate 23 in the direction indicated by the arrows F1, in such a way as to pass in succession, by means of return idlers 24, 25, 27, 29, 31, 33, 35, 37, 39, partially winding on four printing counter-rollers 41, 43, 45, 47, each of which co-operates with a respective printing assembly 1, 3, 5, 7 for printing the substrate 23 itself. The substrate 23 is kept tensioned lengthwise by the weight of a mobile roller 27, which oscillates about an axis X-X

and can be partially balanced by means of a counter-weight 27A. The printing counter-rollers 41, 43, 45, 47 are made to turn all at the same speed by a drive pulley 49A of a motor-reducer assembly 49 provided with encoder, by means of a drive belt drive 51, pulleys 41A, 43A, 45A, 47A fixed integrally with the corresponding counter-rollers, and return idlers 53, 55, 57, 59, 61 of the belt 51. The encoder associated to the motor reducer 49 detects the speed of rotation of the pulley 49A and, together with said speed, the rate of feed of the substrate 23 to be printed, which, since it is tensioned, adheres to the counter-rollers 41-47 without any mutual sliding.

[0019] The four printing assemblies 1, 3, 5, 7 are basically made in the same way; consequently, in the remaining part of the description, reference will be prevalently made to just one of said assemblies, namely the assembly 1. Each printing assembly has a pair of sides 2 (Fig. 2) set at a distance apart from one another by an amount substantially smaller than the distance between the frames 11 of the press. The sides 2 are rigidly connected together by a cross plate 4 (see Fig. 3), to which there are applied, by means of screws, top runners 4A and bottom runners 4B of the ballscrew-recirculation type, designed to co-operate with respective guides 14A, 14B fixed at the front to each cross member 14 for supporting the printing assembly and for enabling free horizontal translation along the front of the printing press. A motor reducer 16 equipped with an angular-displacement detector, such as a potentiometer or an encoder, is applied to the right-hand frame of the printing press (as viewed in Fig. 2) and causes a wormscrew 18 to turn inside a nut screw 20 fixed to the right-hand side 2 of the printing assembly. In this way, when the motor reducer 16 is driven in a controlled way, it is possible to position each printing assembly in the desired printing position along the width of the press.

[0020] Each printing assembly further comprises a pair of cylinders 1A, 1B with parallel axes, the former cylinder being a plate cylinder, and the latter cylinder being the inking cylinder, which turn on rolling bearings applied to the sides 2, and an assembly 6 for blowing hot air onto the substrate 23 which comes out of the printing assembly, so as to dry the ink that has just been applied. The plate cylinder 1A is motor driven by means of a variable-speed motor 8 (Fig. 2) equipped with encoder. The inking cylinder 1B is driven in rotation by the plate cylinder 1A by means of a belt drive 1C (Fig. 1). The drive is set adjacent to one side 2 of the printing assembly and has a transmission ratio such that the peripheral speeds of the cylinders 1A, 1B are equal to one another.

[0021] The blower assembly 6, which is set on the left-hand side of the printing assembly (as viewed in Fig. 2), comprises a centrifugal fan 6A, an electrical-resistance heat exchanger 6B designed to heat the air blown by the fan 6A, and a duct 6C (see also Fig. 3). The latter develops between the sides 2 of the printing assembly and has a lateral extension 6D which develops throughout the width of the printing assembly. Said lateral extension

6D of the duct 6C is inserted through an opening 4C made in the plate 4 of the printing assembly and through an opening 14C made in the cross member 14 of the press, in order to present to the printing substrate 23 a lateral outlet for air flow, which is protected by a wire gauze or screen 6E. The opening 4C and the outlet protected by the wire gauze 6E extend laterally approximately as much as the distance between the sides 2 of the printing assembly, whilst the opening 14C extends approximately as much as the distance between the frames 11 of the press. In this way, the blower assembly 6 enables fast drying of the print performed by the corresponding printing assembly whatever the position occupied by the printing assembly in the width of the press. The blower assembly may also be of the double-chamber type, with recovery of the blown air (this being well known in the art), or else it may be substituted by, or integrated with, a lamp that irradiates heat on the substrate that has just been printed.

[0022] The inking cylinder 1B is supported by the sides 2 (Fig. 4) of the corresponding printing assembly by means of rolling bearings 93. Set between each of said bearings 93 and the corresponding side 2 is a sleeve 95, which is eccentric with respect to the axis of the cylinder 1B and which in turn is integral with a helical gear 97 that is coaxial to the cylinder 1B. Fixed to each side 91 of the printing assembly is a motor-reducer assembly 1D equipped with an encoder or other angular-rotation detector. Fitted to the output shaft of the motor reducer 1D is a wormscrew 99 (see also Fig. 1) which meshes with said helical gear 97 to enable rotation of said eccentric sleeve 95 by a convenient angle such as to enable the inking cylinder 1B to be brought up to the plate cylinder 1A so as to exert a pre-set pressure on the latter, or to enable the inking cylinder 1B and the plate cylinder 1A to be moved away from one another.

[0023] The printing counter-rollers 41-47 (Fig. 1), unlike the cylinders 1A, 1B of the printing assemblies, extend from one frame 14 to the other of press. Said counter-rollers are applied to the frames 11 by means of rolling bearings and corresponding eccentric sleeves similar to the ones 95 (Fig. 4) described for the inking cylinder 1B, and a motor reducer 41B (Fig. 1) with wormscrew which meshes with a gear wheel that is integral with the eccentric sleeve enables the counter-roller to be moved away from the corresponding plate cylinder 1A or enables the contact pressure between the counter-roller and the plate cylinder 1A to be adjusted.

[0024] In this way, the distance between the inking cylinder 1B plus counter-roller 41-47 and the plate cylinder 1A and adjustment of the mutual pressure between them can, for all the printing assemblies, be performed by a central control unit of the printing press by means of commands issued by an operator or by a work program.

[0025] Each printing assembly is moreover equipped with an inking device for applying ink to the inking cylinder 1B (see Figs. 4 and 5), which comprises a tray 101, an ink reservoir 102, and a pipe 104 which connects the

reservoir to the tray. The latter is fixed to a first cross member 103 which can be raised above a second cross member 105 by means of a pair of jack screws 107 fixed to said cross member 105. The assembly made up of the tray 101, the cross members 103, 105, and the jack screws 107 is suspended at the ends of the cylinder 1B by means of a pair of brackets 109 with interposition of corresponding rolling bearings 111. Pins 112 projecting from the sides 2 of the printing assembly and inserted in vertical slots 109A of the brackets 109 prevent the brackets and the tray from oscillating about the axis of the cylinder 1B. The slots 109A extend in the direction of the axis of the inking cylinder 1B, and their extension is such that they enable displacements of the latter obtained by rotation of the eccentric sleeves 95. By means of said jack screws 107, the tray 101 can be kept lowered with the bottom surface of the cross member 103 in the vicinity of the top surface of the cross member 105 (in this position, the level of the ink contained in the tray 101 does not touch the peripheral surface of the inking cylinder), or else it may be lifted and brought to bear upon adjustable contrast surfaces 113. With this latter arrangement, the cylinder 1B is partially immersed in the tray, as illustrated in particular in Fig. 5, and two doctor knives or blades 115, which extend throughout the length of the cylinder 1B and are applied by means of screws to the edges of the tray 101, come into contact with the cylinder 1B to remove, by rotation of the cylinder itself, any excess ink therefrom.

[0026] Thanks to the continuous supply of ink from the reservoir 102, the ink in the tray 101 reaches and maintains a level that grazes the uppermost part of the supply outlet 101A of the ink. In fact, the ink reservoir 102 is closed in an air-tight way by means of a lid 102A and has a manual air valve (not shown in the drawing) which is normally kept closed, so that the only possibility of air entering the reservoir is through the aforesaid outlet 101A and the pipe 104. During printing, the reservoir 102 is suspended at a level higher than that of the tray 101 by means of a hook 117 fixed to the side of the printing assembly. The pipe 104 is a flexible one and, in the event of maintenance operations on the press or in the event of a printing-colour change, enables the reservoir 102 to be detached from the hook 117 and to be brought, thanks to the flexibility of the pipe 104, to a level lower than the level of the tray. In this way, the ink contained in the tray 101 can be made to re-enter the reservoir 102 completely, without any risk of spilling.

[0027] The inking system described above is particularly suited for small or medium printing volumes. For high printing volumes, it is possible to use more complex, already known systems for supplying ink to the tray by means of a pump.

[0028] There may be applied to the plate cylinder 1A a plate 119 (Fig. 6) which extends through an angle α of less than 360° , or else two plates 121 (Fig. 7), each of which extends through an angle β of less than 180° and which are staggered with respect to one another by 180° .

Yet again, it is possible to apply to the plate cylinder 1A a plate 123 (Fig. 8) which extends as far as the periphery of the plate cylinder 1A itself. The plate cylinders of the four printing assemblies can therefore be equipped with plates according to any one of the ways described above, irrespective of one another. In addition, by appropriate lateral staggering of the individual printing assemblies 1, 3, 5, 7, it is possible to print a wide combination of printing patterns in parallel longitudinal bands, including bands that overlap one another or that are altogether superimposed on one another. In addition, in the printing assemblies equipped with plates like the ones illustrated in Fig. 6 or Fig. 7, by cyclically varying the speed of rotation of the plate cylinder 1A during each revolution thereof, it is possible to obtain printing pitches that differ from one band to another band of the substrate. For example, Fig. 9 shows a printing substrate 23 that develops in a continuous strip according to the direction F4, on which, using the press described herein, various printing patterns can be printed in combination:

- by means of the printing assembly 1, a band 23A with the pattern "MAFLEX" (or other full background) repeated continuously with a constant pitch (pa), with a plate of the type designated by 123 applied as illustrated in Fig. 8;
- by means of the printing assembly 3, a band 23B with two patterns 125, 127 different from one another and with a pitch (pb) different from the pitch (pa) of the band 23A, with two plates of the type designated by 121 applied as illustrated in Fig. 7. In this case, the speed of the plate cylinder 1A is varied by cyclically decelerating its rotation as soon as one of the two plates interrupts contact with the printing substrate, and then re-accelerating it to make its speed the same as the rate of advance of the printing substrate 23 before the other plate comes into contact with the printing substrate 23;
- by means of the printing assemblies 5 and 7, the respective bands 23C, 23D obtained with corresponding plates of the type designated by 119 applied as illustrated in Fig. 6. Also in this case, by appropriately adjusting the cyclic variation in speed of the plate cylinder, it is possible to obtain corresponding printing pitches (pc, pd) which are different from one another and from the previous pitches (pa, pb).

[0029] With the above arrangement, in the case of the print of Fig. 9, the encoder and the corresponding variable-speed motor 8 associated to each assembly, which is made up of the plate cylinder 1A and of the inking cylinder 1B, the encoder coupled to the motor reducer 49, which detects the speed of the substrate 23 that is to be printed, and a control unit (not illustrated in the drawing) for driving rotation of said motors 8, 49, which is designed to receive the signals emitted by said encoders and to adjust individually said motors, enable, during

printing contact, the peripheral speed of the plates mounted on the various plate cylinders to be made equal to the rate of advance of the substrate, and, in the case of the printing assemblies 3, 5, 7, while the plates are not in contact with the printing substrate, enable the speed of the plate cylinders 1A to vary with respect to the linear speed of the substrate 23 that is to be printed, which is maintained constant, thus obtaining the pre-set printing pitches of the various printing patterns.

[0030] It is understood that the drawing only illustrates a possible exemplification of the invention given purely to provide a practical demonstration of the said invention, which may vary in its embodiments and arrangements without thereby departing from the scope of the claims. The possible presence of reference numbers in the attached claims has the purpose of facilitating reading thereof in the light of the foregoing description and in no way limits the scope of protection represented by the claims.

Claims

1. A printing press comprising: a multiplicity of printing assemblies, each of which is provided with a plate cylinder for at least one printing plate and an inking cylinder; one or more printing counter-rollers on which a substrate to be printed is guided; wherein at least one of said printing assemblies (1, 3, 5, 7) has the plate cylinder (1A) and the inking cylinder (1B) that have a length substantially smaller than that of the printing counter-roller (41, 43, 45, 47), **characterised in that** said at least one printing assembly (1, 3, 5, 7) is positionable in any position along the axis of said respective printing counter-roller (41, 43, 45, 47) by individual lateral-displacement means (16, 18), to enable printing of corresponding longitudinal bands set alongside one another, or else completely or partially overlapping one another, of the printing substrate, and that said printing assemblies are controllable such that they can be simultaneously operative in staggered positions along said counter roller.
2. The printing press according to claim 1, **characterized in that** it comprises at least two printing assemblies (1, 3, 5, 7), each assembly having an axial length substantially smaller than the axial length of the respective printing counter-roller (41, 43, 45, 47), and that the lateral displacement means of each printing assembly includes guide means (14A, 14B), distinct from the guide means of the other assemblies, each printing assembly being positionable in any position along its corresponding guide means (14A, 14B).
3. The printing press according to Claim 1 or 2, **characterized in that** it comprises individual means of synchronization (8, 49) between rotation of the plate cylinder (1A) and the inking cylinder (1B) of at least one printing assembly on the one hand, and advance of the printing substrate (23) on the other, said means being designed to enable pre-set cyclic variations in the speed of rotation of the plate cylinder (1A)-inking cylinder (1B) assemblies of the printing assembly with respect to the rate of feed of the substrate when the plate is not in contact with it, so as to vary the printing pitch as desired.
4. The printing press according to claim 3, **characterized in that** said individual means of synchronization (8; 49) are settable such that individual printing assemblies operate simultaneously with different printing pitches.
5. The press according to any one of the foregoing claims, **characterized in that** the length of the plate cylinders (1A) and of the inking cylinders (1B) of said at least one printing assembly is approximately a submultiple of the length of the corresponding printing counter-roller (41, 43, 45, 47).
6. The press according to one or more of the foregoing claims, **characterized in that** said means for lateral displacement of each printing assembly comprise a motor reducer (16) provided with an encoder and designed to translate in the direction of the printing width, transversely with respect to the press, the corresponding printing assembly by means of a worm-screw (18) and a nut screw (20) associated thereto.
7. The press according to any one of claims 3 or 4, **characterized in that** said synchronization means comprise an encoder and a variable-speed motor (8) associated to each printing assembly made up of a plate cylinder (1A) and an inking cylinder (1B), an encoder coupled to a motor reducer (49) for feeding the substrate (23) that is to be printed, and means for driving rotation of said motors (8, 49), which are designed to receive the signals emitted by said encoders and to adjust individually the speed of the assembly made up of the plate cylinder (1A) and inking cylinder (1B), according to the rate of feed of the substrate (23) to be printed.
8. The press according to Claim 7, **characterized in that** it comprises, in each position corresponding to each of said printing assemblies, a photoelectric cell designed to detect passage of a reference mark pre-printed on the printing substrate and to activate accordingly operation of the corresponding printing assembly in order to add, on the substrate, further printing patterns positioned in relation to said reference mark.
9. The press according to any one of the foregoing

claims, **characterized in that** to said plate cylinder (1A) a plate (119, 121, 123) is applied, having a length smaller than or equal to the length of the circular development of the cylinder (1A) itself.

10. The press according to one or more of the foregoing claims, **characterized in that** to said plate cylinder (1A) two plates (121) are applied at the same time, set one after the other according to the peripheral development of the cylinder, with a pitch of 180°.
11. The press according to any one of the foregoing claims, in which the inking cylinder (1B) of each printing assembly is supplied with ink by means of a corresponding tray (101) partially filled with ink, in which the inking cylinder (1B) is partially immersed, **characterized in that** the ink in the tray (101) is kept at a constant level by means of a sealed reservoir (102) for supplying ink, which communicates with the atmosphere only by means of the outlet (101A) of a pipe (104) connecting the reservoir to the tray, for flow of ink into the tray.
12. The press according to Claim 11, **characterized in that** the level of ink in the tray (101) is variable by displacing said outlet vertically with respect to the tray by means of an eccentric cam.
13. The press according to Claim 11 or Claim 12, **characterized in that** said connecting pipe (104) is at least in part flexible to enable displacement of the ink reservoir (102) below the tray (101) so as to empty the residual ink from the tray without any risk of spilling.
14. The press according to any one of Claims 10 to 13, **characterized in that** the tray (101) for inking the inking cylinder is suspended from the latter by rotation bearings (111), and **in that** between the tray and said bearings (111) is set a pneumatically driven mechanism (107) for bringing the tray (101) up to the inking cylinder (1B), or else for moving the tray (101) away from the inking cylinder (1B) in a radial direction.
15. The press according to any one of the foregoing claims, **characterized in that** for each printing assembly (1, 3, 5, 7) the pressure between the counter-roller (41, 43, 45, 47) and the plate cylinder (1A) and the pressure between the inking cylinder (1B) and the plate cylinder (1A) is adjustable by means of eccentric sleeves (95) for supporting the bearings (93) of the inking cylinder (1B) and the counter-roller (41, 43, 45, 47), and **in that** each of said eccentric sleeves (95) is integral with the wheel (97) of a wheel-and-wormscrew device, the screw (99) of which is driven by means of a corresponding motor reducer (1D) equipped with an angular-rotation detector connect-

ed to an electronic control unit of said motor reducer so that it is possible, via remote control, to bring together said counter-roller (41, 43, 45, 47) and said inking roller (1B) with the plate cylinder (1A), and to vary the contact pressure between them.

16. The press according to any one of the foregoing claims, and arranged for printing a substrate made of plastic film coming out of an extruder, **characterized in that** it is equipped with supporting rollers (21) designed to roll along parallel guides (15, 17) to facilitate displacement of said press in front of a device for delivering a substrate to be printed, such as an extruder or a reel or a battery of such delivery means.

Patentansprüche

1. Eine Druckmaschine, die umfasst: eine Vielzahl von Druckanordnungen, von denen jede mit einem Klischeezylinder für mindestens eine Druckplatte und mit einer Farbauftragswalze versehen ist; eine oder mehrere Gegenrollen, auf denen ein Druckstoff geführt wird; wobei mindestens eine der Druckanordnungen (1, 3, 5, 7) über den Klischeezylinder (1A) und die Farbauftragswalze (1B) verfügt, deren Länge wesentlich geringer ist als die der Gegenrolle (41, 43, 45, 47), **dadurch gekennzeichnet, dass** die mindestens eine Druckanordnung (1, 3, 5, 7) mit Hilfe von separaten Vorrichtungen zur seitlichen Verschiebung (16, 18) in eine beliebige Position entlang der Achse der jeweiligen Gegenrolle (41, 43, 45, 47) gebracht werden kann, um das Drucken entsprechender längslaufender Bänder des Druckstoffs zu ermöglichen, die nebeneinander angeordnet sind oder auch einander teilweise oder ganz überschneiden, und dass die Druckanordnungen so gesteuert werden können, dass sie gleichzeitig in versetzten Positionen entlang der Gegenrolle eingesetzt werden können.
2. Die Druckmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** sie mindestens zwei Druckanordnungen (1, 3, 5, 7) umfasst, wobei die Achsenlänge jeder Anordnung wesentlich kleiner ist als die Achsenlänge der jeweiligen Gegenrolle (41, 43, 45, 47) und dass die Vorrichtung zur seitlichen Verschiebung jeder Druckanordnung Führungsvorrichtungen (14A, 14B) umfasst, die sich von den Führungsvorrichtungen der anderen Anordnungen unterscheiden, wobei jede Druckanordnung in eine beliebige Position entlang der jeweiligen Führungsvorrichtung (14A, 14B) gebracht werden kann.
3. Die Druckmaschine nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** sie separate Vorrichtungen zur Synchronisierung (8, 49) der Rotation des Klischeezylinders (1A) und der Farbauftragswalze

- (1B) mindestens einer Druckanordnung einerseits und dem Vorschub des Druckstoffs (23) andererseits umfasst, wobei die Vorrichtungen so konstruiert sind, dass sie eine voreingestellte zyklische Änderung der Rotationsgeschwindigkeit der Klischeezylinder (1A)-Farbauftragswalzen (1B)-Anordnungen der Druckanordnung hinsichtlich des Einschubs des Druckstoffs ermöglichen, wenn das Klischee diesen nicht berührt, so dass der Druckabstand beliebig geändert werden kann.
4. Die Druckmaschine nach Anspruch 3, **dadurch gekennzeichnet, dass** die einzelnen Vorrichtungen zur Synchronisierung (8; 49) so eingestellt werden können, dass einzelne Druckanordnungen gleichzeitig mit unterschiedlichem Druckabstand eingesetzt werden.
5. Die Druckmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Länge der Klischeezylinder (1A) und der Farbauftragswalzen (1B) der mindestens einen Druckanordnung ungefähr einem Teiler der Länge der entsprechenden Gegenrolle (41, 43, 45, 47) entspricht.
6. Die Druckmaschine nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Vorrichtungen zur seitlichen Verschiebung jeder Druckanordnung einen Getriebemotor (16) umfasst, der mit einem Geber versehen ist und dazu konstruiert ist, die entsprechende Druckanordnung mit Hilfe eines daran angebrachten Schneckengetriebes (18) und einer Schraubenmutter (20) schräg zu der Druckmaschine in Richtung der Druckbreite zu versetzen.
7. Die Druckmaschine nach einem der Ansprüche 3 oder 4, **dadurch gekennzeichnet, dass** die Vorrichtung zur Synchronisierung einen Geber umfasst und einen Regelmotor (8), der an jeder aus einem Klischeezylinder (1A) und einer Farbauftragsrolle (1B) bestehenden Druckanordnung angebracht ist, wobei an einen Getriebemotor (49) für den Vorschub des zu bedruckenden Druckstoffs (23) ein Geber angeschlossen ist, und Vorrichtungen für den Rotationsantrieb dieser Motoren (8, 49), die dazu konstruiert sind, die von den Gebern gesendeten Signale zu empfangen und die Geschwindigkeit der aus dem Klischeezylinder (1A) und der Farbauftragswalze (1B) bestehenden Anordnung einzeln gemäß der Vorschubgeschwindigkeit des zu bedruckenden Druckstoffs (23) abzugleichen.
8. Die Druckmaschine nach Anspruch 7, **dadurch gekennzeichnet, dass** sie in jeder den Druckanordnungen entsprechenden Position eine photoelektrische Zelle umfasst, die dazu konstruiert ist, den Durchgang einer auf dem Druckstoff vorgedruckten Referenzmarkierung zu erkennen und dementsprechend den Einsatz der jeweiligen Druckanordnung auszulösen, um auf dem Druckstoff weitere Druckmuster aufzutragen, deren Anordnung sich an der Referenzmarkierung orientiert.
9. Die Druckmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** an dem Klischeezylinder (1A) ein Klischee (119, 121, 123) angebracht ist, dessen Länge kleiner oder gleich der Länge des umlaufenden Ablaufs des Zylinders (1A) selbst ist.
10. Die Druckmaschine nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** an den Klischeezylinder (1A) gleichzeitig zwei Klischees (121) entsprechend dem Ablauf an der Außenfläche des Zylinders mit einer Neigung von 180° hintereinander angebracht sind.
11. Die Druckmaschine nach einem der vorangehenden Ansprüche, wobei die Farbauftragswalze (1B) jeder Druckanordnung mit Hilfe einer entsprechenden teilweise mit Farbe gefüllten Wanne (101) mit Farbe versorgt wird, in die die Farbauftragswalze teilweise eingetaucht ist, **dadurch gekennzeichnet, dass** die Farbe in der Wanne (101) auf gleichmäßigem Niveau gehalten wird mit Hilfe eines abgedichteten Speichers (102) für die Versorgung mit Farbe, der nur durch die Öffnung (101A) eines Rohrs (104), das zum Zweck des Zuflusses der Farbe in die Wanne den Speicher mit der Wanne verbindet, mit der Atmosphäre korrespondiert.
12. Die Druckmaschine nach Anspruch 11, **dadurch gekennzeichnet, dass** das Niveau der Farbe in der Wanne (101) durch vertikales Versetzen der Öffnung in Bezug auf die Wanne mit Hilfe einer exzentrischen Nocke geändert werden kann.
13. Die Druckmaschine nach Anspruch 11 oder 12, **dadurch gekennzeichnet, dass** das Verbindungsrohr (104) zumindest teilweise biegsam ist, um das Entfernen des Farbspeichers (102) unter der Wanne (101) zu ermöglichen, damit Restfarbe aus der Wanne entfernt werden kann ohne dass die Gefahr besteht, diese zu verschütten.
14. Die Druckmaschine nach einem der Ansprüche 10 bis 13, **dadurch gekennzeichnet, dass** die Wanne (101) für die Versorgung der Farbauftragswalze mit Farbe an letzterer durch Drehlager (111) aufgehängt ist und dass sich zwischen der Wanne und den Lagern (111) ein pneumatisch angetriebener Mechanismus (107) befindet, der die Wanne (101) nach oben zu der Farbauftragswalze (1B) befördert oder auch die Wanne (101) von der Farbauftragswalze (1B) radial wegbewegt.

15. Die Druckmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** bei jeder Druckanordnung (1, 3, 5, 7) der Druck zwischen Gegenrolle (41, 43, 45, 47) und Klischeezylinder (1A) und der Druck zwischen Farbauftragswalze (1B) und Klischeezylinder (1A) mit Hilfe exzentrischer Muffen (95) zur Befestigung der Lager (93) der Farbauftragswalze (1B) und der Gegenrolle (41, 43, 45, 47) geändert werden kann und dass jede der exzentrischen Muffen (95) in das Rad (97) einer Rad-Schneckengetriebe-Anordnung eingebaut ist, deren Schneckengetriebe (99) durch einen entsprechenden Getriebemotor (1D) angetrieben wird, der mit einem Drehwinkel-Abtaster ausgestattet ist, welcher mit einer elektronischen Steuereinheit des Getriebemotors verbunden ist, so dass es mit Hilfe einer Fernbedienung möglich ist, die Gegenrolle (41, 43, 45, 47) und die Farbauftragswalze (1B) mit dem Klischeezylinder (1A) zusammenzubringen und den Anpressdruck zwischen diesen zu verändern.
16. Die Druckmaschine nach einem der vorangehenden Ansprüche und für den Druck eines Druckstoffs angeordnet, der aus einer aus einem Extruder kommenden Kunststoffolie besteht, **dadurch gekennzeichnet, dass** sie mit Stützwälzen (21) ausgestattet ist, die dazu konstruiert sind, um parallele Führungen zu laufen (15, 17), um die Versetzung der Druckmaschine vor ein Gerät zu ermöglichen, welches den Druckstoff anliefert, wie etwa ein Extruder oder eine Spule oder eine Gruppe solcher Transportmittel.

Revendications

1. Presse d'impression comprenant : une pluralité d'ensembles d'impression dont chacun est muni d'un cylindre à plaque pour au moins une plaque d'impression et d'un cylindre d'encrage, un ou plusieurs contre-rouleaux d'impression sur lequel/sur lesquels un substrat à imprimer est guidé, dans laquelle au moins l'un desdits ensembles d'impression (1, 3, 5, 7) comporte le cylindre à plaque (1A) et le cylindre d'encrage (1B) qui ont une longueur sensiblement plus petite que celle du contre-rouleau d'impression (41, 43, 45, 47), **caractérisée en ce que** ledit au moins un ensemble d'impression (1, 3, 5, 7) est apte à être positionné dans n'importe quelle position respectivement le long de l'axe dudit contre-rouleau d'impression respectif (41, 43, 45, 47) par un moyen de déplacement latéral individuel (16, 18) pour permettre l'impression de bandes longitudinales correspondantes réglées bord à bord ou se chevauchant complètement ou partiellement l'une l'autre, du substrat d'impression, **et en ce que** lesdits ensembles d'impression sont aptes à être commandés afin qu'ils puissent être actionnés simultanément

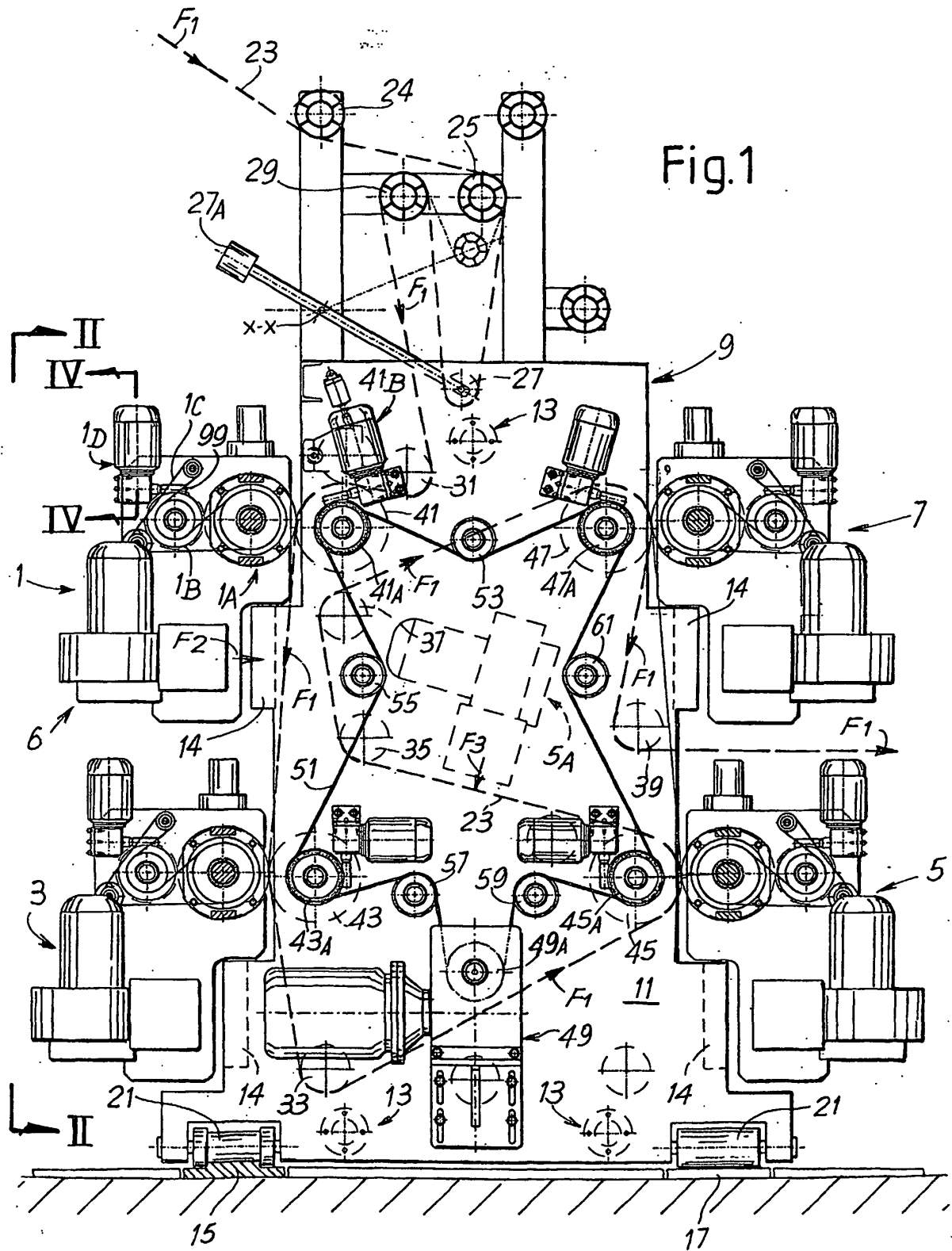
ment dans des positions échelonnées le long dudit contre-rouleau.

2. Presse d'impression selon la revendication 1, **caractérisée en ce qu'elle** comprend au moins deux ensembles d'impression (1, 3, 5, 7), chaque ensemble ayant une longueur axiale substantiellement plus petite que la longueur axiale du contre-rouleau d'impression respectif (41, 43, 45, 47) **et en ce que** le moyen de déplacement latéral de chaque ensemble d'impression comprend un moyen de guidage (14A, 14B) distinct du moyen de guidage des autres ensembles, chaque ensemble d'impression étant apte à être positionné dans n'importe quelle position le long de son moyen de guidage correspondant (14A, 14B).
3. Presse d'impression selon la revendication 1 ou 2, **caractérisée en ce qu'elle** comprend un moyen individuel de synchronisation (8, 49) entre la rotation du cylindre à plaque (1A) et le cylindre d'encrage (1B) d'au moins un ensemble d'impression d'une part et l'avance du substrat d'impression (23) d'autre part, ledit moyen étant conçu pour permettre des variations cycliques préétablies dans la vitesse de rotation des ensembles cylindre à plaque (1A) - cylindre d'encrage (1B) de l'ensemble d'impression par rapport à la vitesse d'alimentation du substrat quand la plaque n'est pas en contact avec celui-ci afin de faire varier le pas d'impression comme souhaité.
4. Presse d'impression selon la revendication 3, **caractérisée en ce que** lesdits moyens individuels de synchronisation (8, 49) sont réglables afin que les ensembles d'impression individuels agissent simultanément avec différents pas d'impression.
5. Presse selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la longueur des cylindres à plaque (1A) et des cylindres d'encrage (1B) dudit au moins un ensemble d'impression est approximativement un sous-multiple de la longueur du contre-rouleau d'impression correspondant (41, 43, 45, 47).
6. Presse selon l'une ou plusieurs des revendications précédentes, **caractérisée en ce que** lesdits moyens pour le déplacement latéral de chaque ensemble d'impression comprennent un réducteur de moteur (16) prévu avec un encodeur et conçu pour une translation dans la direction de la largeur d'impression transversalement par rapport à la presse, de l'ensemble d'impression correspondant au moyen d'une vis sans fin (18) et d'une vis à écrou (20) associée à celle-ci.
7. Presse selon l'une quelconque des revendications 3 ou 4, **caractérisée en ce que** lesdits moyens de

synchronisation comprennent un encodeur et un moteur à vitesses variables (8) associé à chaque ensemble d'impression constitué d'un cylindre à plaque (1A) et d'un cylindre d'encrage (1B), un encodeur couplé à un moto-réducteur (49) pour amener le substrat (23) qui doit être imprimé et des moyens pour l'entraînement en rotation desdits moteurs (8, 49) qui sont conçus pour recevoir les signaux émis par lesdits codeurs et pour ajuster individuellement la vitesse de l'ensemble constitué du cylindre à plaque (1A) et du cylindre d'encrage (1B) conformément à la vitesse d'alimentation du substrat (23) devant être imprimé.

8. Presse selon la revendications 7, **caractérisée en ce qu'elle** comprend, dans chaque position correspondant à chacun desdits ensembles d'impression, une cellule photoélectrique conçue pour détecter le passage d'une marque de référence pré-imprimée sur le substrat d'impression et pour activer en conséquence le fonctionnement de l'ensemble d'impression correspondant afin d'ajouter sur le substrat d'autres motifs d'impression positionnés par rapport à ladite marque de référence.
9. Presse selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'au** dit cylindre à plaque (1A) on applique une plaque (119, 121, 123) ayant une longueur plus petite ou égale à la longueur du développement circulaire du cylindre (1A) lui-même.
10. Presse selon une ou plusieurs des revendications précédentes, **caractérisée en ce qu'au** dit cylindre à plaque (1A) on applique deux plaques (121) en même temps, réglées l'une après l'autre conformément au développement périphérique du cylindre avec un pas de 180°.
11. Presse selon l'une quelconque des revendications précédentes, dans laquelle le cylindre d'encrage (1B) de chaque ensemble d'impression est alimenté avec de l'encre au moyen d'un plateau correspondant (101) partiellement rempli avec de l'encre, dans lequel le cylindre d'encrage (1B) est partiellement immergé, **caractérisée en ce que** l'encre dans le plateau (101) est maintenue à un niveau constant au moyen d'un réservoir étanchéifié (102) pour amener de l'encre, qui communique avec l'atmosphère seulement au moyen de la sortie (101A) d'un tuyau (104) reliant le réservoir au plateau pour l'écoulement de l'encre dans le plateau.
12. Presse selon la revendication 11, **caractérisée en ce que** le niveau de l'encre dans le plateau (101) est variable en déplaçant ladite sortie verticalement par rapport au plateau au moyen d'un excentrique à came.

13. Presse selon la revendication 11 ou la revendication 12, **caractérisée en ce que** ledit tuyau de liaison (104) est au moins en partie flexible pour permettre le déplacement du réservoir d'encre (102) en dessous du plateau (101) afin de vider l'encre résiduelle du plateau sans risque de déversement.
14. Presse selon l'une quelconque des revendications 10 à 13, **caractérisée en ce que** le plateau (101) pour l'encrage du cylindre d'encrage est suspendu à partir de ce dernier par des paliers de rotation (111) et **en ce que**, entre le plateau et lesdits paliers (111), est établi un mécanisme à entraînement pneumatique (107) pour amener le plateau (101) jusqu'au cylindre d'encrage (1B) ou pour déplacer le plateau (101) à distance du cylindre d'encrage (1B) dans une direction radiale.
15. Presse selon l'une quelconque des revendications précédentes, **caractérisée en ce que** pour chaque ensemble d'impression (1, 3, 5, 7), la pression entre le contre-rouleau (41, 43, 45, 47) et le cylindre à plaque (1A) et la pression entre le cylindre d'encrage (1B) et le cylindre à plaque (1A) est réglable au moyen de manchons excentrique (95) pour supporter les paliers (93) du cylindre d'encrage (1B) et le contre-rouleau (41, 43, 45, 47) et **en ce que** chacun desdits manchons excentrique (95) est solidaire d'une roue (97) d'un dispositif à vis sans fin et roue dont la vis (99) est entraînée au moyen d'un moto-réducteur correspondant (1D) muni d'un détecteur de rotation angulaire relié à une unité de commande électronique dudit moto-réducteur de sorte qu'il est possible, par l'intermédiaire d'une commande à distance, d'amener conjointement ledit contre-rouleau (41, 43, 45, 47) et ledit rouleau d'encrage (1B) avec le cylindre à plaque (1A) et de faire varier la pression de contact entre eux.
16. Presse selon l'une quelconque des revendications précédentes et agencée pour imprimer un substrat constitué d'un film en matière plastique venant d'une extrudeuse, **caractérisée en ce qu'elle** est munie de rouleaux de support (21) conçus pour rouler le long de guides parallèles (15, 17) pour faciliter le déplacement de ladite presse en avant d'un dispositif pour délivrer un substrat devant être imprimé comme une extrudeuse ou une bobine ou une batterie d'un tel moyen de fourniture.



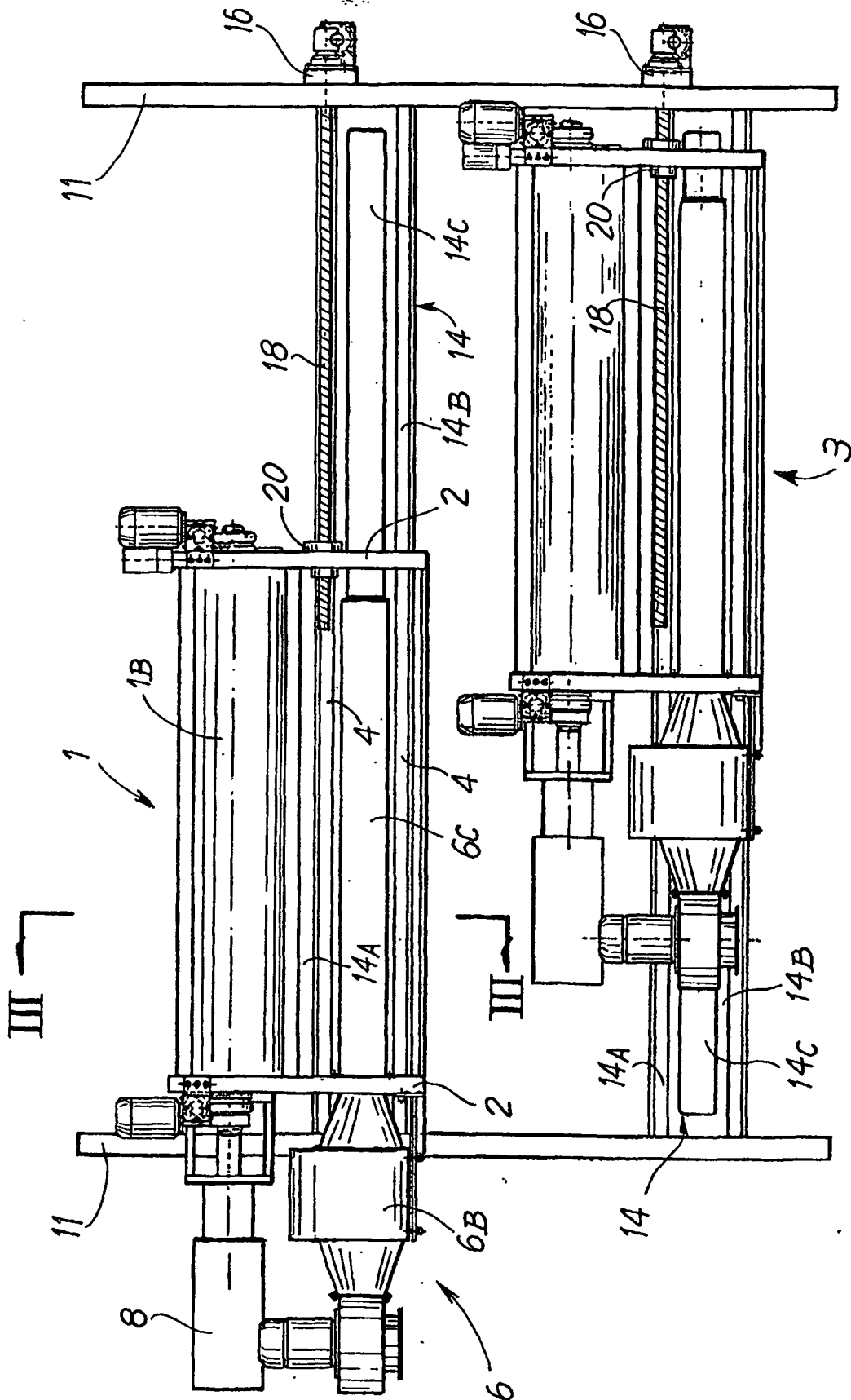


Fig. 2

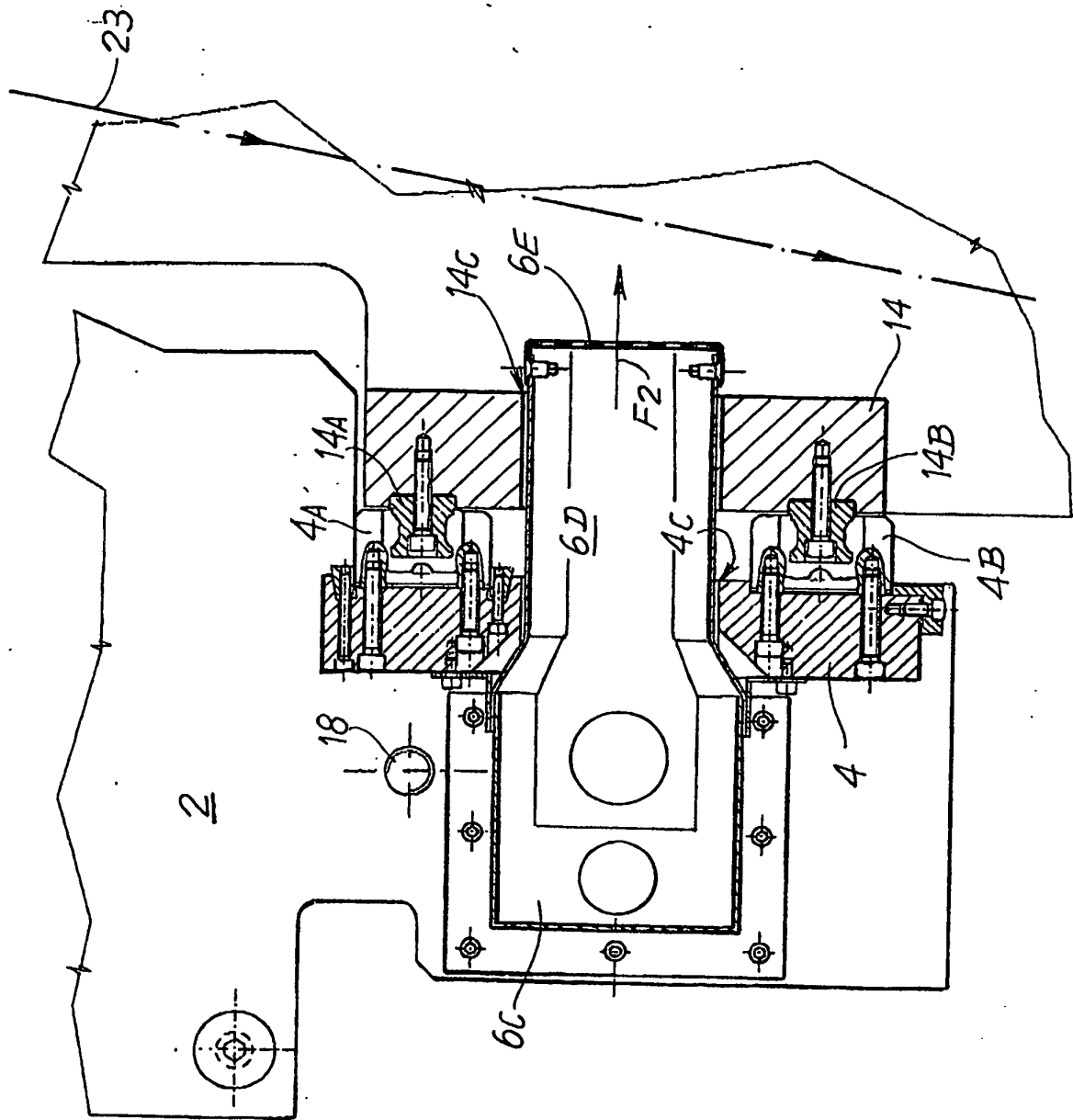
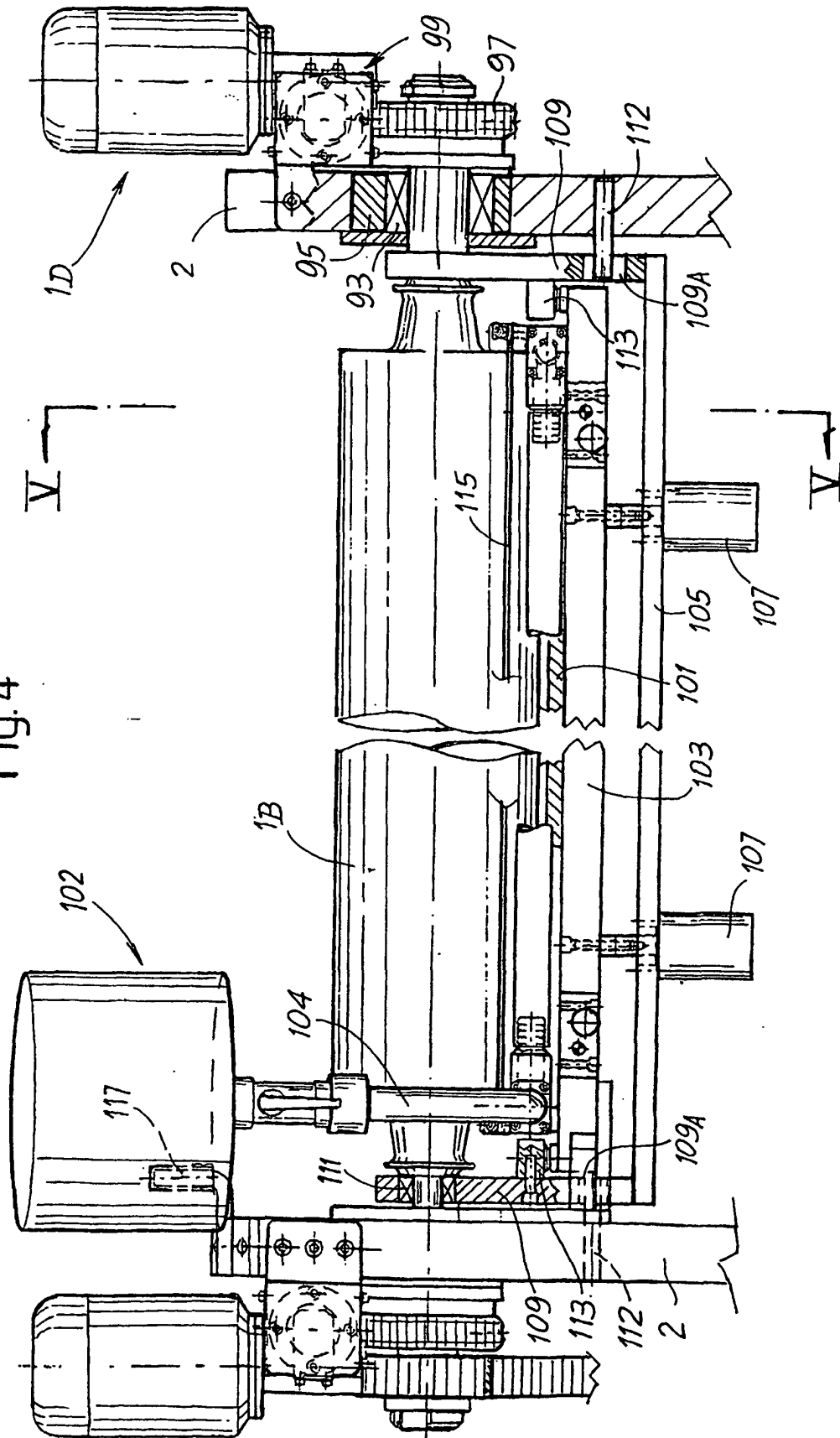
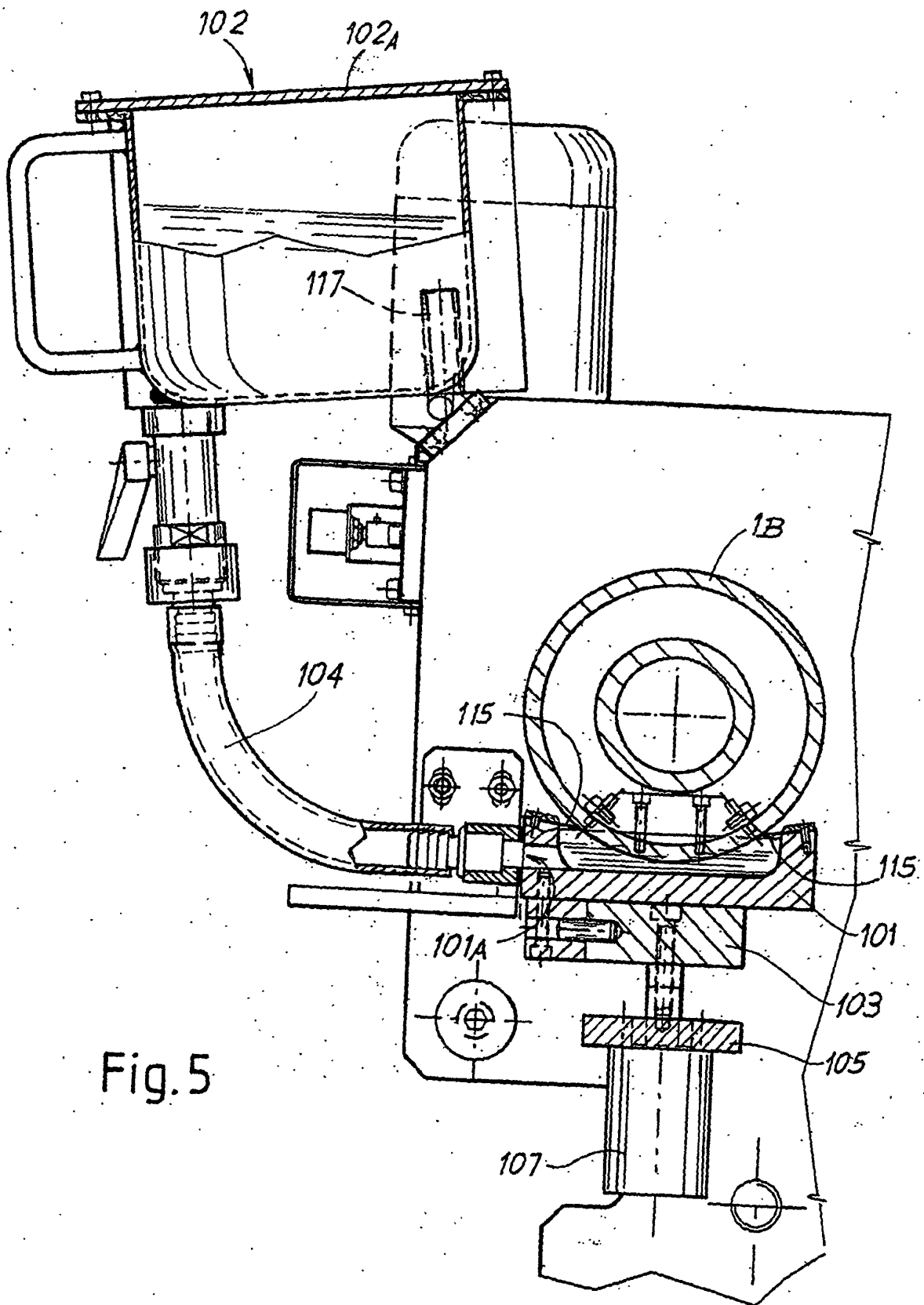


Fig. 3

Fig. 4





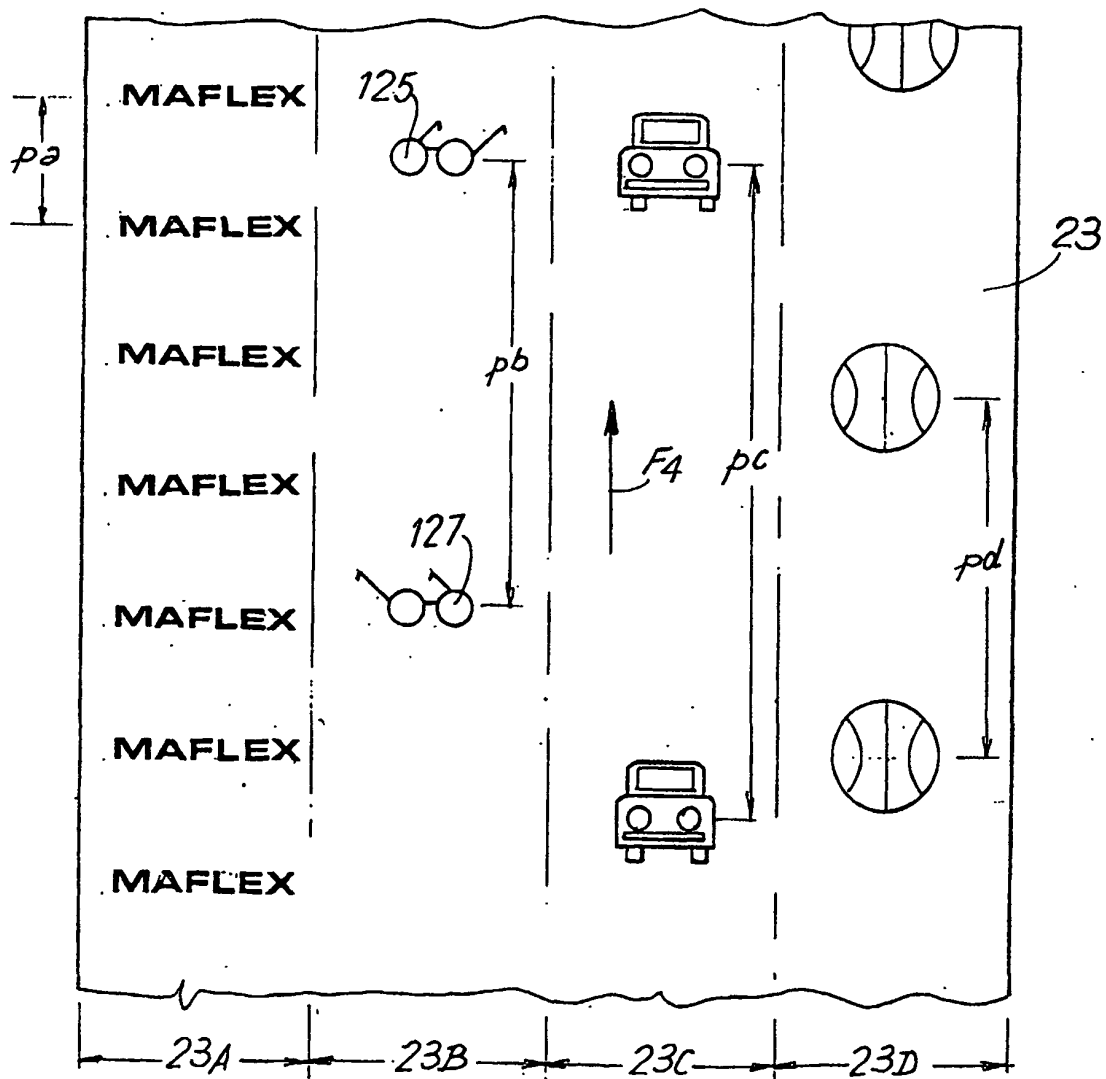
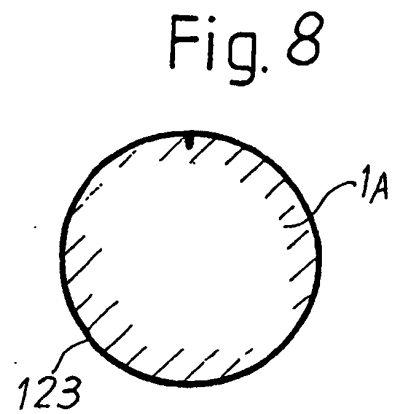
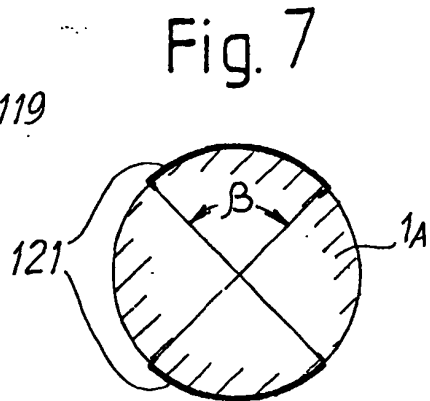
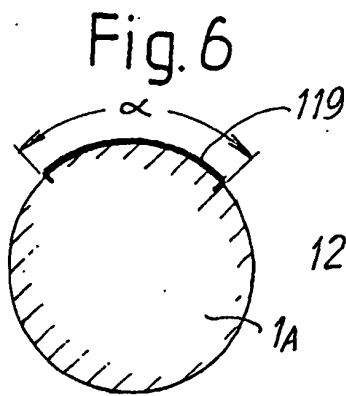


Fig. 9