

⑫

EUROPEAN PATENT APPLICATION

⑳ Application number: **83105796.3**

⑤① Int. Cl.³: **B 65 H 45/16**

㉔ Date of filing: **13.06.83**

③① Priority: **05.07.82 IT 6785082**

⑦① Applicant: **OFFICINE MECCANICHE GIOVANNI CERUTTI S.p.A., Via M. Adam 66, I-15033 Casale Monferrato (IT)**

④③ Date of publication of application: **18.01.84**
Bulletin 84/3

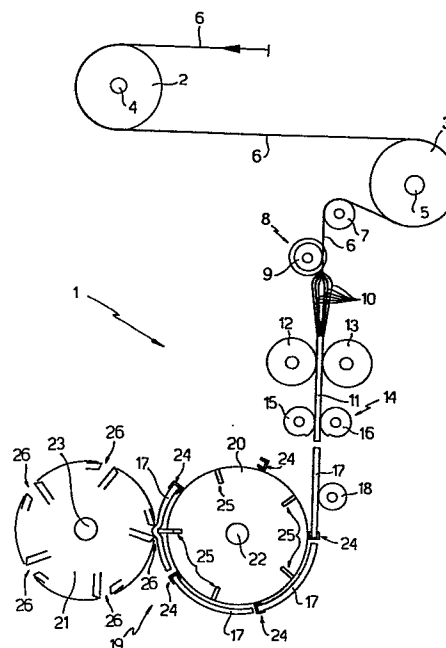
⑦② Inventor: **Pane, Mario, Via Pasubio 34, I-13039 Trino Vercellese (Vercelli) (IT)**

⑧④ Designated Contracting States: **AT BE CH DE FR GB LI LU NL SE**

⑦④ Representative: **Jorio, Paolo et al, c/o Ingg. Carlo e Mario Torta Via Viotti 9, I-10121 Torino (IT)**

⑤④ Improved folder for a rotogravure printing press.

⑤⑦ An improved folder for a rotogravure printing press, in which a pincer cylinder (20) is provided with a plurality of pincer units (24) the number of which is equal to the number of a plurality of gripper units (26) carried by a gripper cylinder (21) parallel and substantially tangential to the pincer cylinder (20); this latter carrying between each pair of adjacent pincer units (24) a pusher bar (25) the outward movement of which is regulated according to a given programme.



"IMPROVED FOLDER FOR A ROTOGRAVURE PRINTING PRESS"

The present invention relates to an improved folder for a rotogravure printing press.

5 Folders for rotogravure printing presses known up to now have comprised a pincer cylinder and a counter rotating gripper cylinder parallel to and disposed substantially in contact with one another along a generatrix. The pincer cylinder is provided
10 externally with an odd number (normally five) of moveable pincer units distributed along respective rows coincident with an equivalent number of generatrices of the pincer cylinder. The pincer cylinder further carries, in positions substantially
15 intermediate between each pincer unit and the next in the direction of rotation of the cylinder, a blade or "pusher bar" operable to perform, in the region of the said contact generatrix of the said two cylinders, hereinbelow called the "release position", a radial
20 out and back movement with respect to the pincer cylinder between a position totally withdrawn within the pincer cylinder and a position in which the said pusher bar projects partially from the pincer cylinder.

 The gripper cylinder is provided externally with
25 an even number (generally four) of gripper units moveably disposed along respective generatrices of the gripper cylinder, and is connected to the pincer cylinder in such a way that at each passage of a pusher bar through the release position there is a
30 corresponding passage of a gripper unit, the pusher bar being interposed during its radial outward movement between the open jaws of the gripper of the said unit.

From what has been explained above it is possible to see how in folders known until now the number of pincer units distributed around the periphery of the pincer cylinder is always different from the number of gripper units distributed around the periphery of the gripper cylinder.

The above indicated difference is necessary for the purpose of being able to perform an accumulating production, for example, a "two impression accumulated" production. In fact, in this case, there must be an odd number of pincer units uniformly distributed around the periphery of the pincer cylinder in such a way as to permit each pincer unit to receive a sheet relating to the first impression. and, at the next revolution, a sheet relating to the second impression. On the other hand, the fact that there are an even number of gripper units distributed around the gripper cylinder enormously facilitates the accumulating production. In fact, the avoidance of transferring the sheet relating to the first impression during its first passage through the release position is obtained simply by removing every alternate gripper unit from the gripper cylinder. At the same time on the pincer cylinder there are mounted control devices operable to inhibit the opening of the sheet locking pincers when a sheet is not transferred upon its passage through the release position.

The operating mode described above has significant disadvantages in that, in the first place, because of the difference in the number of pincer units and the number of gripper units, a pincer

unit cooperates with the same gripper unit only every n revolutions, where n is the number of gripper units, thereby creating a significant problem in the construction of pincer cylinders and gripper cylinders, and in the adjustment of their movement.

In the second place, the modifications necessary to adapt a known folder to accumulating production require a relatively long time to perform and leaves the movements of the pusher blades uncontrolled.

These latter, in fact, always snap outwardly as they traverse through the release position in such a way that, when a sheet is not transferred because there is no gripper unit at the release position, the sheet is identically engaged by the associated pusher bar which, in some cases, can cause a displacement of the sheet with respect to the associated pincers, and an imperfect superimposition with respect to the next sheet.

The object of the present invention is that of providing a folder for rotogravure printing machines which will be free from the above described disadvantages.

The said object is achieved by the present invention in that it relates to a folder for rotogravure printing machines comprising a pincer cylinder having uniformly distributed around its periphery a determined number of pincer units and a corresponding number of pusher bars; a gripper cylinder disposed parallel to the said pincer cylinder in a substantially tangential position thereto and carrying uniformly distributed around its periphery a given number of gripper units; first actuator means for displacing in succession each said pusher bar towards and away from

an operative extracted position starting from a retracted rest position upon passage of the pusher bar itself through a release position facing the said gripper cylinder, and second actuator means
5 for causing each said pincer unit to open in coincidence with the outward displacement of the associated pusher bar; characterised by the fact that the number of said pincer units and the number of said gripper units are equal to one another, control
10 means being provided for controlling the operation of the said first and said second actuator means according to a given programme.

Further characteristics and advantages of the present invention will become apparent from the
15 following description with reference to the attached drawings, which illustrate a non-limitative embodiment thereof, in which:

Figure 1 schematically illustrates in side view a folder formed according to the principles of the
20 present invention;

Figure 2 is a perspective and schematic view with parts removed for clarity of a first detail of Figure 1;

Figure 3 is a perspective and schematic view with parts removed for clarity of a second detail of Figure 1;
25

Figures 4, 5 and 6 schematically illustrate a detail of Figure 2 in three different operating positions; and

30 Figures 7, 8 and 9 schematically illustrate a detail of Figure 3 in three different operating positions.

In Figure 1 there is illustrated a rotogravure printing machine generally indicated 1, and including at least a first printing cylinder 2 and at least a second printing cylinder 3, the support shafts of which, respectively indicated 4 and 5, are rotatably mounted on a support (not illustrated) constituting the frame of the machine 1.

The cylinders 2 and 3 are able to cooperate by means of their facing surfaces, with a continuous web 6 of paper which has a width at most equal to the length of the cylinders 2 and 3 and advances, in use, along the machine 1 at a speed equal to the peripheral velocity of the cylinders 2 and 3. These latter carry on their outer surfaces incisions reproducing that which it is desired to print and generally defining panels (not illustrated) each occupying a portion of the outer surface of the respective cylinder 2, 3. The surface of each cylinder 2, 3 is in general sub-divided in annular strips (not illustrated) the width of which is equal to that of the said panels, and the development of which is equal to the height of the said panels, or to a multiple thereof. In particular, the cylinders 2 and 3 are defined as "single incision" if each of the said strips contains a single panel, whilst they are defined as "double" or more incisions if each of the said strips contain two or more panels in the same column and which are different from one another.

In use, the web 6 once completely printed on both its surfaces by the rollers 2 and 3, is forwarded by means of at least one return roller 7 to a longitudinal cutting unit 8 including a cutter cylinder 9 which, cooperating with the web 6, divides it into a plurality of strips 10 each of which corresponds to

a respective annular strip of the said cylinders 2 and 3.

Downstream of the cutting unit 8, the strips 10 are superimposed in a predetermined order in such a way as to form a continuous bundle 11 which is supplied, by means of drive rollers 12 and 13 to a transverse cutting unit 14 including a cutting cylinder 15 and a counter cylinder 16. These latter, cooperating together, cut the continuous bundle 10 into successive segments 17 which hereinbelow will be indicated with the term "copies". The copies 17 are fed in succession, by means of an accelerator or splitting unit 18 to a folder generally indicated 19 and are each constituted by a bundle of superimposed sheets the number of which is equal to that of the strips 10 and having a length equal to the height of the panels (not illustrated) of the cylinders 2 and 3. In particular, each of the said sheets constitutes two pages of rotogravure to be produced and must therefore be folded in two transversely of its height, in the folder 19.

The folder 19 includes two counter rotating cylinders 20 and 21 keyed on to respective shafts 22 and 23 rotatably supported by the said frame (not illustrated) of the machine 1 and disposed parallel to and at a distance from one another such that the cylinders 20 and 21 are substantially tangential to one another along a generatrix.

The cylinder 20, which hereinbelow will be indicated with the term "pincer cylinder" has five external pincer units 24 disposed along respective generatrices uniformly distributed around the cylinder, and five folder units 25 each of which is disposed between two adjacent pincer units 24.

The cylinder 21, which hereinbelow will be indicated with the term "gripper cylinder" has five external gripper units 26 disposed along respective uniformly distributed generatrices.

5 As illustrated in Figure 2, each pincer unit 24 includes two shafts 27 and 28 parallel to the shaft 22 and rotatably supported by two end walls (not illustrated) of the pincer cylinder 20. The shaft 27 carries, keyed thereto at one end, an orthogonal
10 lever 29 constituting a first rocker of an articulated twin rocker quadrilateral 30 the second rocker of which is constituted by a lever 31 keyed at one end onto a shaft 32 parallel to the shaft 27 and rotatably supported by the two end walls (not illustrated) of
15 the pincer cylinder 20. The free ends of the levers 29 and 31 are connected together by means of the link 33 which carries at its connection point with the lever 31 a roller 34 functioning as a cam follower for a cylindrical fixed cam 35 freely mounted on
20 the shaft 22 and having externally, along its active profile, two recessed sections 36 and 37.

Keyed to one end of the shaft 28 is an orthogonal lever 38 constituting a first rocker of an articulated twin rocker quadrilateral 39 the second rocker of
25 which is constituted by a lever 40 keyed at one end to a shaft 41 parallel to the shaft 28 and rotatably supported by the said end walls (not illustrated) of the pincer cylinder 20. The free ends of the levers 38 and 40 are connected together by a link 42 which
30 carries, connected at its connection point with the lever 40, a roller 43 serving as a cam follower for a cylindrical cam 44 supported freely by the shaft 22 and having externally, around its active profile, six

recessed sections 45 and six recessed sections 46 disposed alternately and uniformly distributed around the cam.

The link 42 further carries, connected thereto, a roller 47 coaxial with the roller 43 and having the same diameter as this latter. The roller 47 serves as a cam follower for a rotatable cylindrical cam 48 constituted by two discs 48a and 48b (Figures 4, 5 and 6) which are rigidly connected together. The cam 48 is freely supported by the shaft 22, and of the discs 48a and 48b, the first has three and the second four raised zones respectively indicated 49a and 49b.

As illustrated in Figures 4, 5 and 6 the zones 49a are uniformly distributed about the disc 48a at 120° from one another, whilst the zones 49b are disposed in pairs in such a way that each pair is spaced from the other by 120° and the zones of each pair form between one another an angle of 60° .

The zones 49 have a radius substantially equal to that of the cam 44 and extend radially to the outside of a cylindrical profile having a radius at most equal to that of the recessed sections 45 and 46.

The cams 44 and 48 are connected to one another in an angularly adjustable position as will be explained below and are rotated together by a drive device 50, which in the illustrated example is constituted, purely by way of example, by the toothed wheel 51 which can be rigidly angularly fixed to the cams 44 and 48 and coupled to a pinion 52 keyed onto a drive shaft 53 the angular velocity of which remains in a fixed ratio different from one with the angular velocity of the shaft 22.

- 9 -

From the shaft 27 transversely extend bars 54, hereinafter indicated with the term "curved pincers" interspersed with bars 55, hereinafter indicated with the term "flat pincers" extending transversely from the shaft 28. The ends of the curved pincers 54 and the flat pincers 55 are moveable with the respective shafts 27 and 28 to rotate between a closed operative position, in which they cooperate with an abutment surface 56 constituting a portion of the outer surface of the pincer cylinder 20, and an open position, in which they are spaced from the abutment surface 56.

As illustrated in Figure 3, each folder unit 25 includes a shaft 57 parallel to the shaft 22 and rotatably supported by the said two end walls (not illustrated) of the pincer cylinder 20. The shaft 57 carries, keyed to one of its ends, an orthogonal lever 58 constituting a first rocker of a double rocker articulated quadrilateral 59 the second rocker of which is constituted by a lever 60 keyed to one end of a shaft 61 parallel to the shaft 22 and rotatably supported by the said two end walls (not illustrated) of the pincer cylinder 20. The free ends of the levers 58 and 60 are connected together by means of a link 62 which has connected to it, at its point of connection to the lever 60, a roller 63 serving as a cam follower both for a fixed cylindrical cam 64 mounted freely rotatably on the shaft 22 and having externally, around its active profile, a recessed section 65, and for a rotatable cylindrical cam 66 freely supported by the shaft 22 and the active profile of which has at least five projecting zones 67 the

radius of which is substantially equal to that of the cam 66, which extend radially outwardly from a cylindrical profile having a radius at most equal to that of the recessed section 65.

5 As illustrated in Figures 7, 8 and 9, the zones 67 comprise three zones 67a and two zones 67b. These latter have a width about twice that of the zones 67a and form together an angle of 120° whilst the zones 67a are distributed non-uniformly about the remaining
10 240° .

 The cam 6 is driven to rotate by a drive device 68 which in the illustrated example is constituted, purely by way of example, by a toothed wheel 69 rigidly connected to the cam 66 and coupled to a pinion 70 keyed
15 on a drive shaft 71 the angular velocity of which remains in a constant ratio with the angular velocity of the shaft 22.

 The shaft 57 has a longitudinally extending lateral projection 72 extending radially from the
20 shaft 57 and carrying connected to its free end three aligned blades 73 disposed in a radial position with respect to the shaft 22 and constituting, as an assembly, a pusher bar 74 moveable with the shaft 57 between a retracted rest position in which the pusher bar 74 is
25 disposed entirely within the outer surface of the pincer cylinder 20, and an extended operative position in which part of the pusher bar 74 projects radially outwardly of the outer surface of the pincer cylinder 20.

 The folder 19 can be set up for production with
30 or without accumulation by suitably adjusting the relative positions of the cams 44 and 48 and the cams 64 and 66 respectively.

Production without accumulation is effected by arranging the cams 48 and 66 in a relative position in which none of their projecting zones 49 and 67 prevent the rollers 47 and 63 from entering the respective recessed sections 46 and 65.

In particular, as illustrated in Figure 4, the discs 48a and 48b are disposed in such a way that the associated projecting zones 49a and 49b do not interfere with any of the recessed sections 45 or with any of the recessed sections 46. As illustrated in Figure 7, the phase of the cam 66 is so arranged that the roller 63, which rolls about the axis of the shaft 22 at a velocity normally greater than that of the cams 66, passes over a double raised zone 67a before engaging the recessed section 65.

During production without accumulation each copy 17 is received by a respective pincer unit 24 of the pincer cylinder 20 at a loading position in which the roller 34 engages the recessed section 36 of the fixed cam 35 and the roller 43 must again engage a recessed section 45 of the cam 44. In other words, when a copy 17 is supplied to the accelerator unit 18 at the associated pincer unit 24, the curved pincers 54 of this latter are spaced from the abutment surface 56 in such a way as to permit the front edge of the associated copy 17 to advance into contact with the surface 56. Subsequent rotation of the pincer cylinder 20 causes disengagement of the roller 34 from the recessed section 36, with the consequent closure of the pincers 54 on the front edge of the said copies 17 which is thus locked onto the cylinder 20, and the subsequent passage of the roller 43 through the recessed section 45 of the cam 44. During this movement of the roller 43 the flat pincers 55 open

coming out from under the copy 17 locked by the corresponding curved pincers 54, and then reclose over the front edge of the copy 17. This latter, thus locked, is disposed along the outer edge of the pincer cylinder 20 between two successive pincer units 24 and with its middle disposed over the pusher bar 74 of the folder unit 25 interposed between the said pair of pincer units 24.

The release of the said copy 17 from the pincer cylinder 20 takes place when the associated pusher bar 74 passes the generatrix along which the cylinders 20 and 21 are disposed substantially in contact. The said release position is reached by the pusher bar 74 simultaneously with the corresponding gripper unit 26 which has been previously opened by actuator means (not illustrated) and known per se carried by the gripper cylinder 21.

Further to what has been explained above, it is suitable to state that since the number of gripper units 26 and that of the pusher bars 74 is the same, each pusher bar 74 traversing the release position always couples with the same gripper unit 26. Consequently, the synchronisation between the cylinders 20 and 21 will always be perfect once the relative position of each pusher bar 74 and the associated gripper unit 26 has been adjusted.

When a pusher bar 74 reaches the release position, the roller 63 engages the recessed section 65 of the cam 64 causing the pusher bar 74 to project out, which by raising the middle of the associated copy 17 from the cylinder 20 engages it between the open grippers 26.

These latter, upon reclosing, grip the copy 17 folded in half separating it from the pincer cylinder 20 and transporting it towards a utilisation point. The complete separation of the copy 17 from the pincer cylinder 20 is allowed by the fact that when the pusher bar 74 snaps outwardly the roller 34 of the pincer unit 24 which precedes it in the direction of rotation of the pincer cylinder 20 engages the recessed section 37 of the fixed cam 35 thus causing the opening of the associated curved pincers 54 and, simultaneously, the roller 43 of the said pincer unit 24 engages the recessed section 46 of the cam 44 causing the opening of the flat pincers 55 and definitively freeing the copy 17 already gripped by the grippers 26.

In production with accumulation, for example, two impressions with accumulation, the copies 17 do not become transferred one by one from the pincer cylinder 20 to the gripper cylinder 21 as in the operation without accumulation, but rather in stacks constituted by one copy 17 relating to a first impression and a second copy 17 relating to a second impression superimposed over one another in a predetermined order.

This two impression operation with accumulation is made possible by suitably arranging the phases of the cams 48 and 66, which are driven to rotate by the shafts 53 and 71 at a predetermined angular velocity different (normally less) from the speed of rotation of the shaft 22 and, therefore, of the pincer cylinder 20.

In particular, as illustrated in Figure 8, the recessed zones 67 of the cam 66 are superimposed over the recessed section 65 of the cam 64 in a sequence

such that only one out of two rollers 63 which traverse in succession over the cam 64 engage the recessed section 65, whilst the others remain raised by the effect of one of the projecting zones 67.

5 Similarly, as illustrated in Figure 5, the projecting zones 49 of the cam 48 interfere with one out of each two recessed sections 46 of the cam 44 in such a way that only one of each two rollers 43 which traverse
10 in succession over the cam 44 engage the associated recessed section 46 thereof, whilst the others remain raised by the effect of engagement with the associated roller 47 with one of the projecting zones 49.

With reference to what has been described above it is suitable to state that, during the said operation
15 with accumulation, the cam 48 prevents a roller 43 from entering the recessed section 46 of the cam 44 for the whole of the time that the roller 63 which follows it in the direction of rotation of the pincer cylinder 20 is prevented from entering the recessed
20 section 65 of the cam 64 by one of the projecting zones 67 of the cam 66.

During operation with accumulation, for example, two impressions with accumulation, the copies 17
25 advanced by the pincer cylinder 20 towards the release position to be taken up by the gripper units 26 are alternatively of a first and second type and are related one to a first impression and the other to a second impression of the cylinders 2 and 3. When
30 the first copy 17 of the first type is present with its middle in front of the gripper unit 26 disposed at the release position the rotatable cams 66 driven

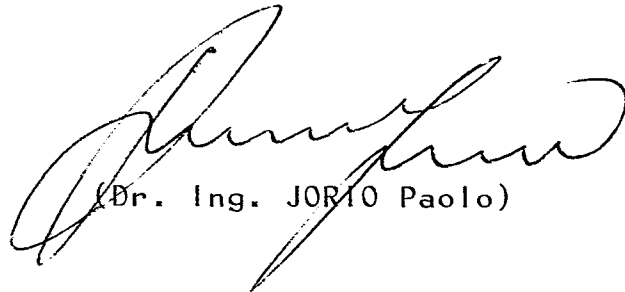
by the shaft 71 is arranged with one of its projecting zones 67 in correspondence with the recessed section 65 of the cam 64 thereby preventing the lowering of the roller 63 and, therefore, preventing the pusher bar 74 from projecting out. Simultaneously, the cam 48 is disposed with its projecting zone 49 in correspondence with the recessed section 46 to cooperate with the roller 47 in such a way as to prevent the roller 43 from entering the associated recessed section 46 of the cam 44, whilst the roller 44 enters normally into the recessed section 37 of the fixed cam 35.

As a consequence of this, when the middle of the said copy 17 of the first type is located in the release position, the grippers 26 open and close normally but do not effect transfer of the copy 17 adjacent to it given the failure of the associated pusher bar 74 to operate, and the copy 17 remains connected to the pincer cylinder 20 by the effect of the flat pincers 55 which remain closed, whilst the curved pincers 54 open and close normally.

The said copy 17 of the first type, once it has passed the release position, is carried back by the pincer cylinder 20 towards the loading position at which the said copy 17 is maintained connected to the pincer cylinder 20 by the flat pincers 55 whilst the curved pincers 54 open to receive a second copy 17 (which will be of the second type given that there are an odd number of pincer units 24), and then by the curved pincers 54 whilst the flat pincers 55 open and then reclose onto the stack formed by the two superimposed copies 17. These latter are then sent forward towards the release position at which they are

transferred normally to the gripper cylinder 21.

5 In Figures 6 and 9 the assembly of cams 44 and 48 and the cam 66 are arranged to perform an operation with three accumulated impressions, the execution of which is easily deducible from what has been explained above in relation to operation with two accumulated impressions.

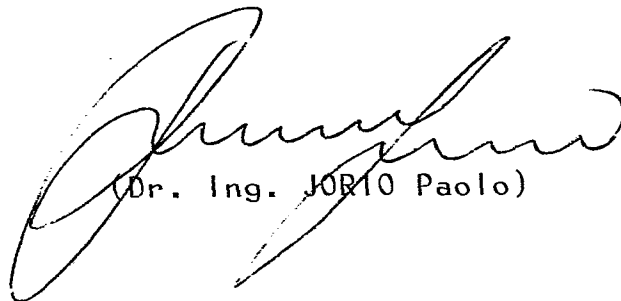


(Dr. Ing. JORIO Paolo)

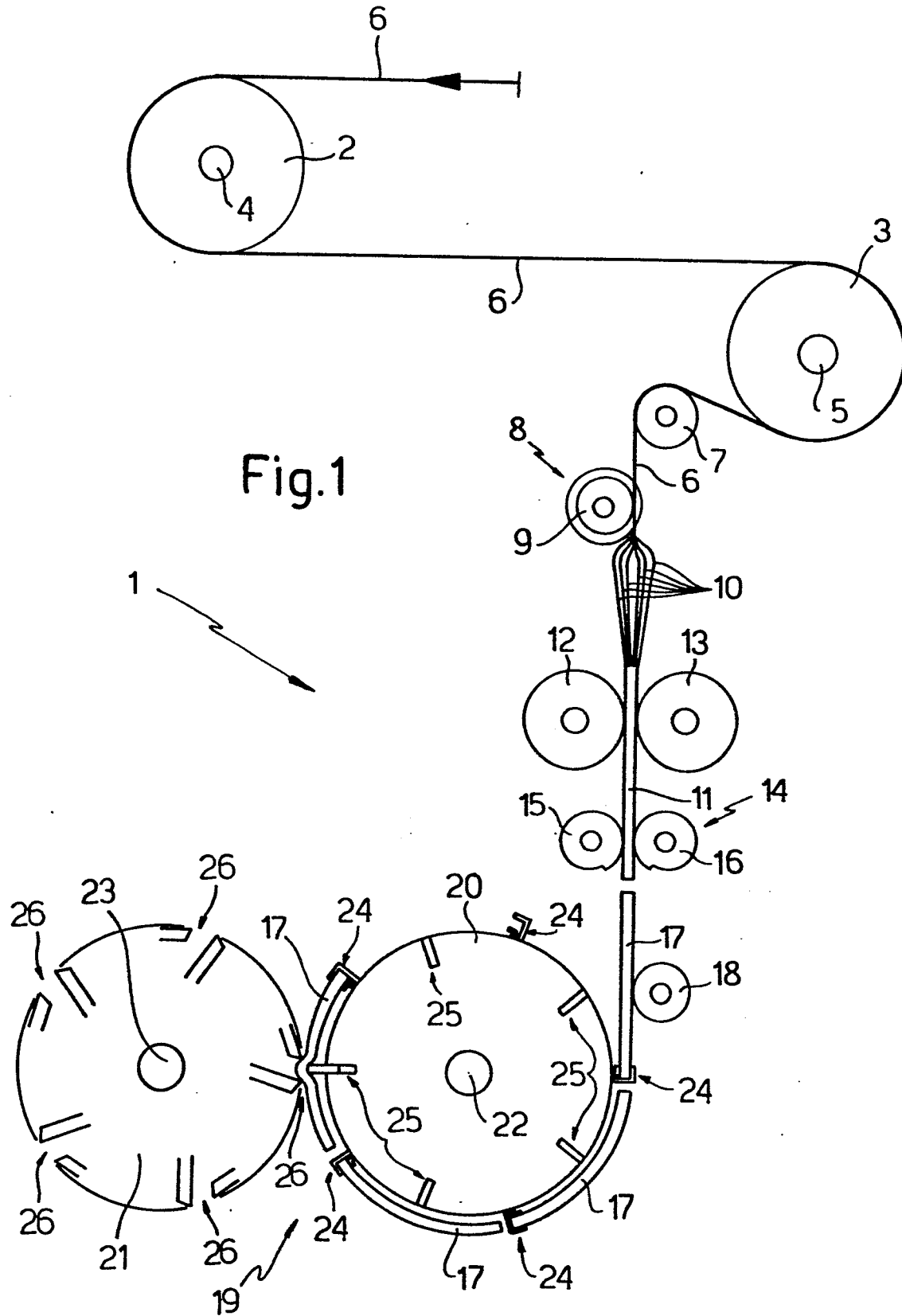
CLAIMS

1. A folder for a rotogravure printing machine comprising a pincer cylinder (20) having uniformly distributed around its periphery a given number of pincer units (24) and a corresponding number of pusher bars (25); a gripper cylinder (21) disposed parallel to the said pincer cylinder (20) in a position substantially tangential thereto and carrying uniformly distributed around its periphery a given number of gripper units (26); first actuator means (64) for displacing each said pusher bar (25) in succession towards and away from an operative extended position starting from a retracted rest position upon the passage of the pusher bar (25) through a release position facing the said gripper cylinder (21); and second actuator means (35, 44) for causing each said pincer unit (24) to open in synchronism with the outward displacement of the associated pusher bar (25); characterised by the fact that there are an equal number of pincer units (24) and gripper units (26), and control means (48, 53 - 66, 71) are provided for adjusting the operation of the said first and said second actuator means (64 - 35 - 44) in a predetermined programme.
2. A folder according to Claim 1, characterised by the fact that the said control means include further actuator means (66) operable to act in synchronism with the said first actuator means (69) to nullify its effect in a determined sequence upon passage of the said pusher bars (25) through the said release position.

3. A folder according to Claim 2, characterised by the fact that the said first actuator means include a cam (64) fixed with respect to the said pincer cylinder (20) and having a recessed zone (65); each
5 said pusher bar (25) including a cam follower (63) operable to engage the said recessed zone (65) to cause the displacement of the pusher bar (25) itself towards the said extended position; and the said further actuator means include a further cam (66) rotatable with
10 respect to the said pincer cylinder (20) under the thrust of adjustable actuator means (71); the said further cam having raised zones (67) operable to cooperate with each said cam follower (63) to prevent it from engaging into the said recessed zone (65) in
15 a determined sequence.



(Dr. Ing. JORIO Paolo)



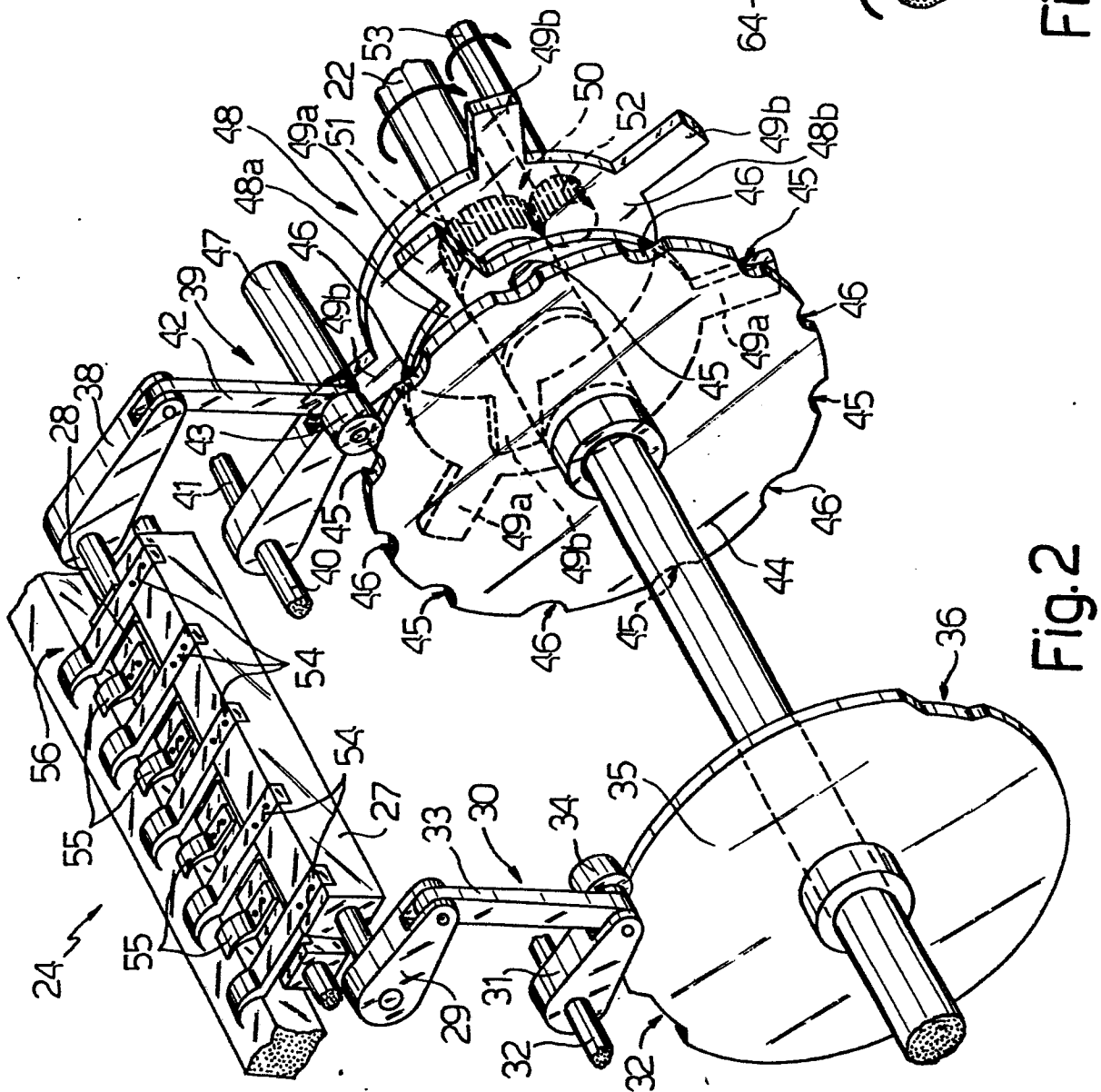


Fig. 2

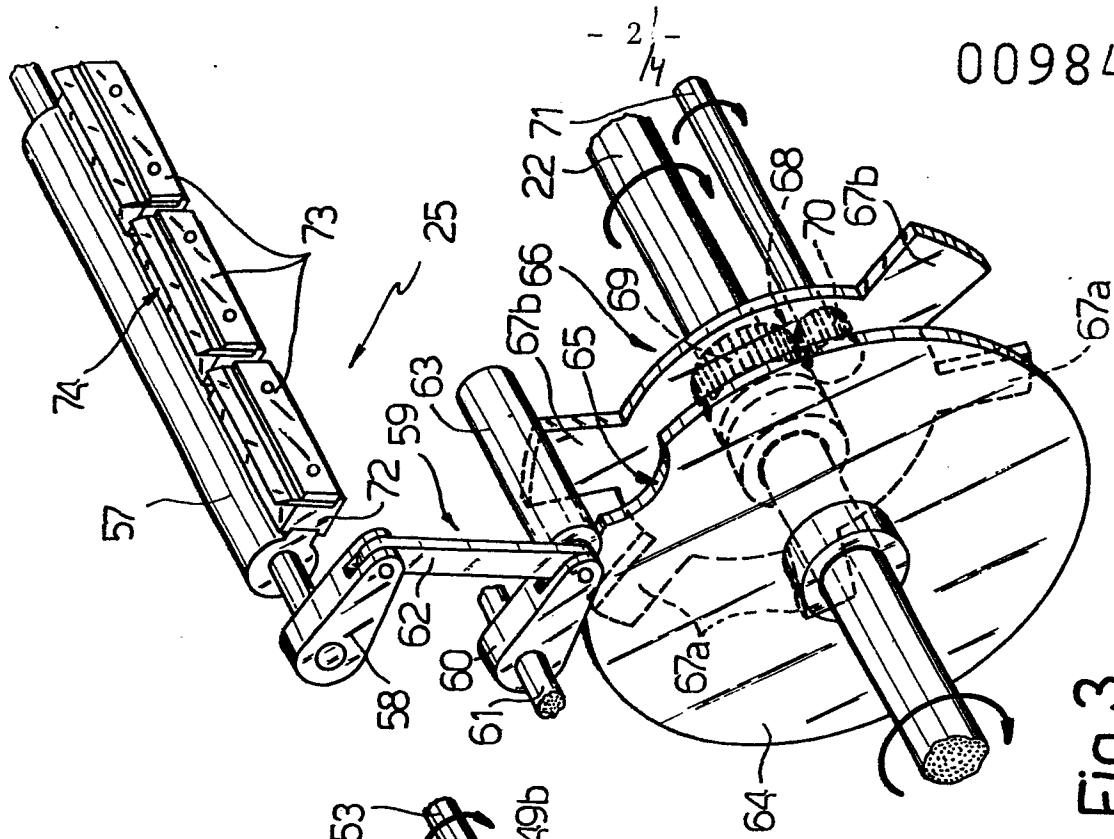


Fig. 3

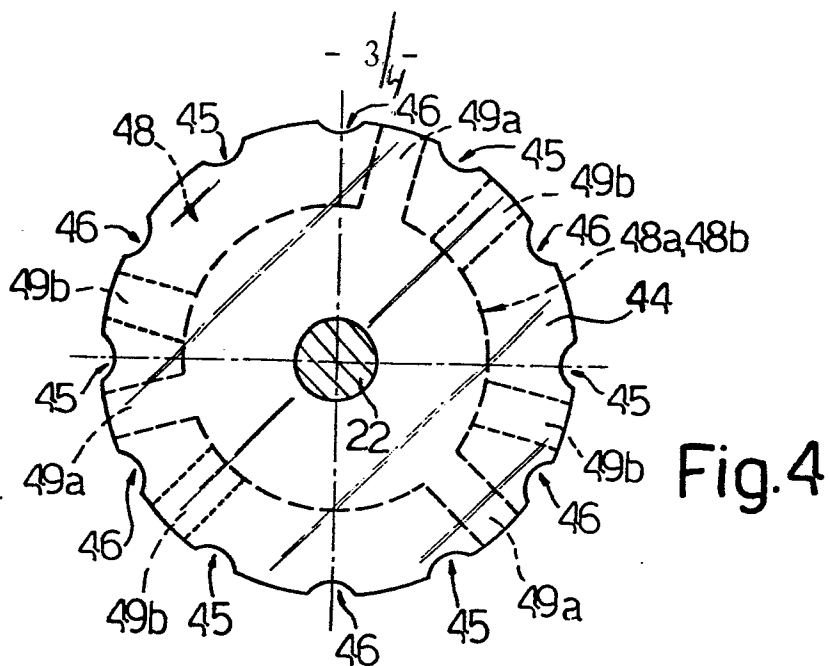


Fig. 4

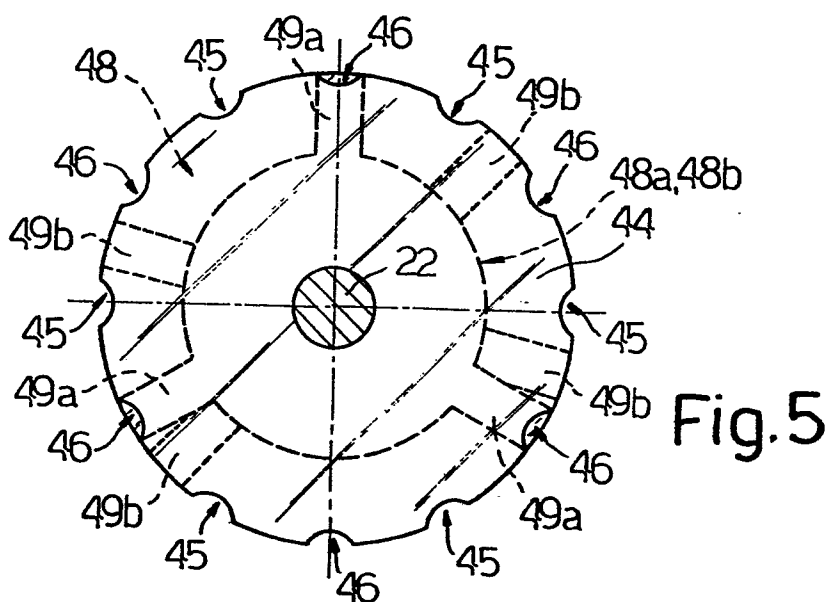


Fig. 5

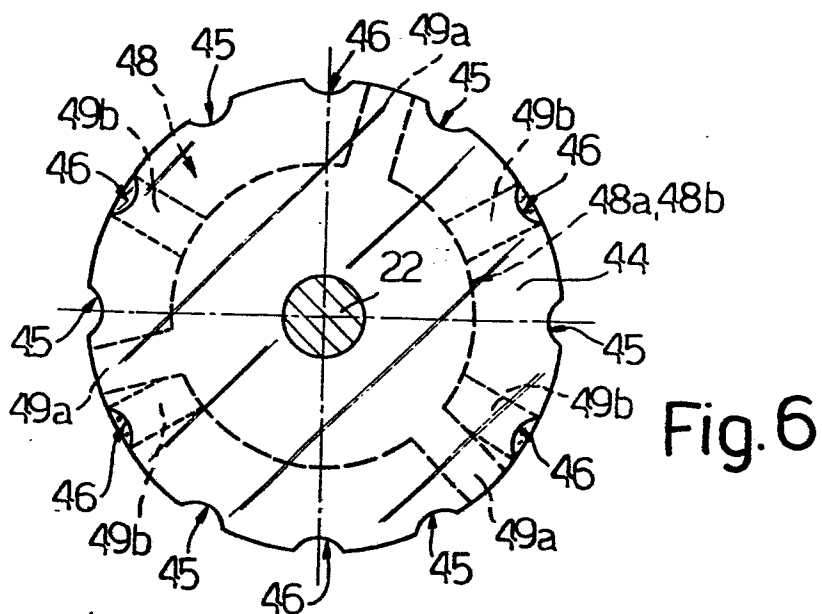


Fig. 6

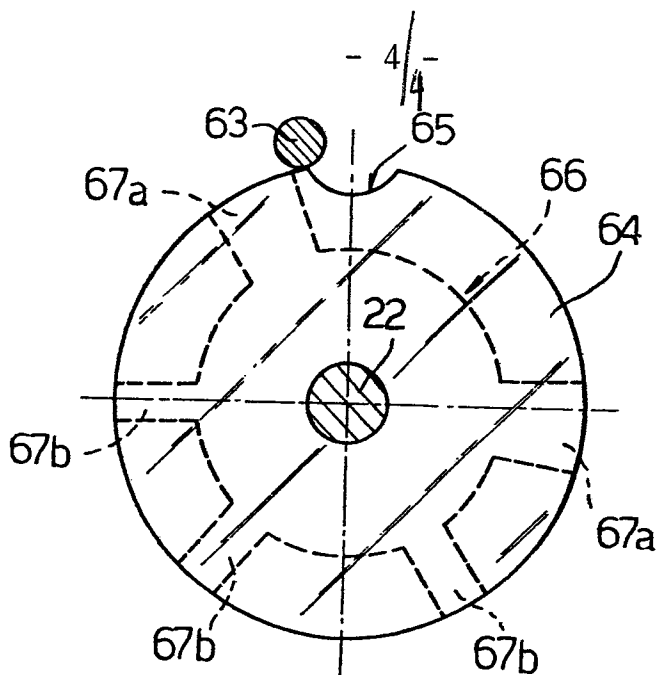


Fig. 7

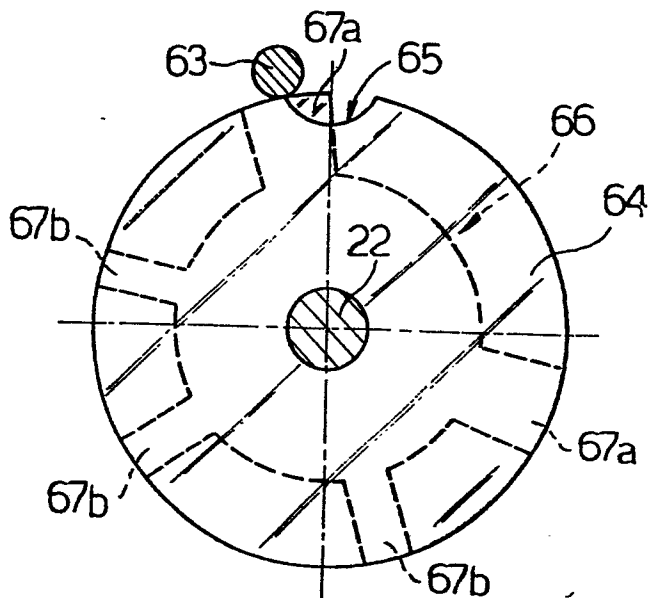


Fig. 8

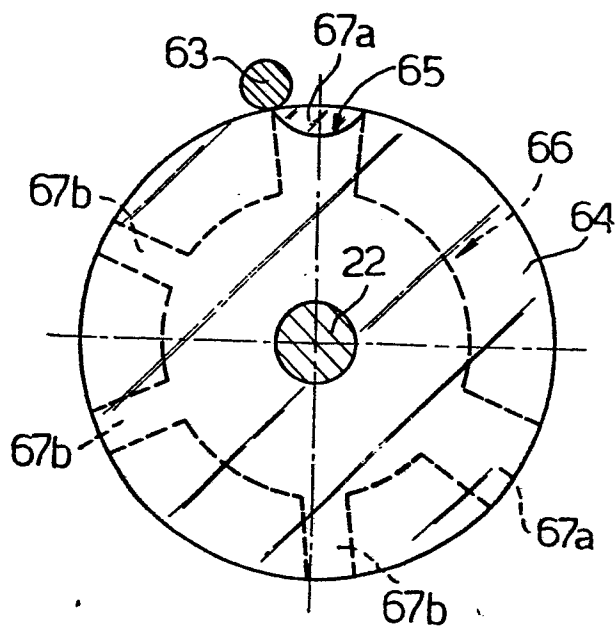


Fig. 9