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 [33] **Belgium**
 [31] **49672**

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[54] **APPARATUS FOR PRINTING BOUND STAPLED OR GLUED BOOKS**
 16 Claims, 12 Drawing Figs.

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101/316
 [51] Int. Cl. **B41f 1/06**
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78, 79, 80, 316, 317, 318, 298, 301, 407

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ABSTRACT: An improved apparatus for printing bound, stapled or glued books, and more particularly check books and other stacked sheets, wherein a printing and stamping device and the stacked sheets carry out two reciprocating movements relative to each other and parallel and perpendicularly to a printing plane, and wherein in one of two end positions of the relative parallel movement, corresponding to one of the two end positions of the vertical relative movement, the printing is effected, whilst in the zone of the other end position of the relative parallel movement the individual sheets are raised after the printing by suction and are then pivoted into a plane tilted against the printing plane and held in this position.

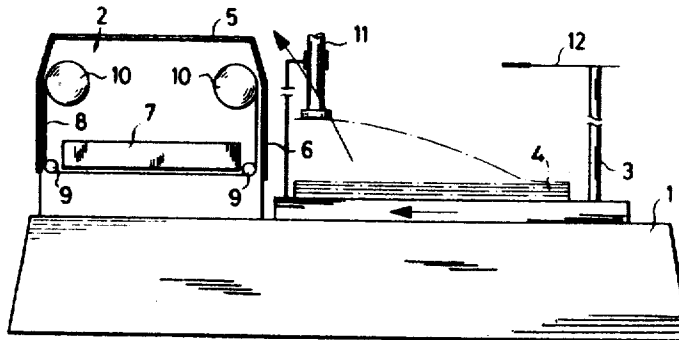


Fig. 1

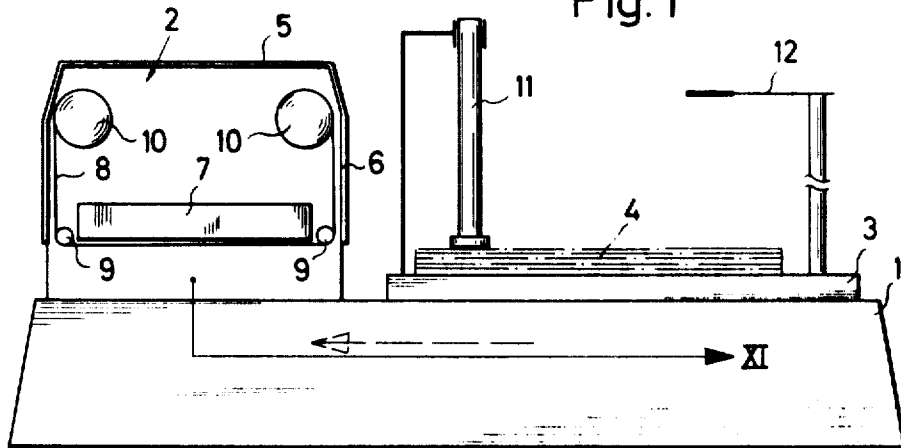


Fig. 2

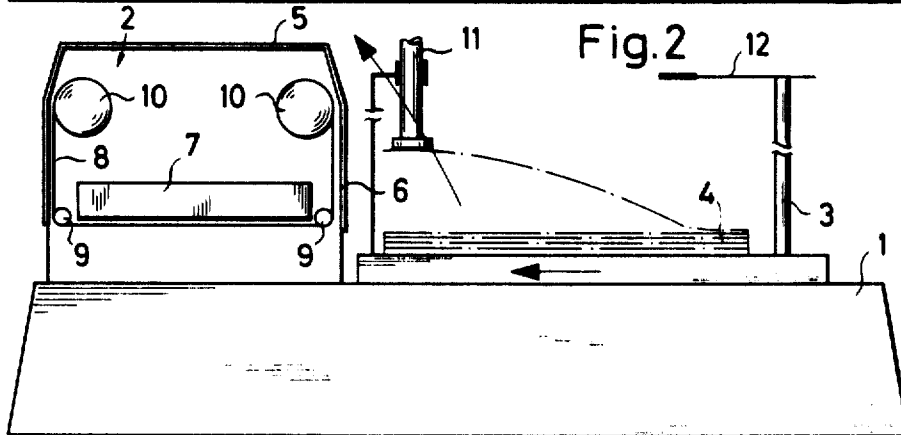
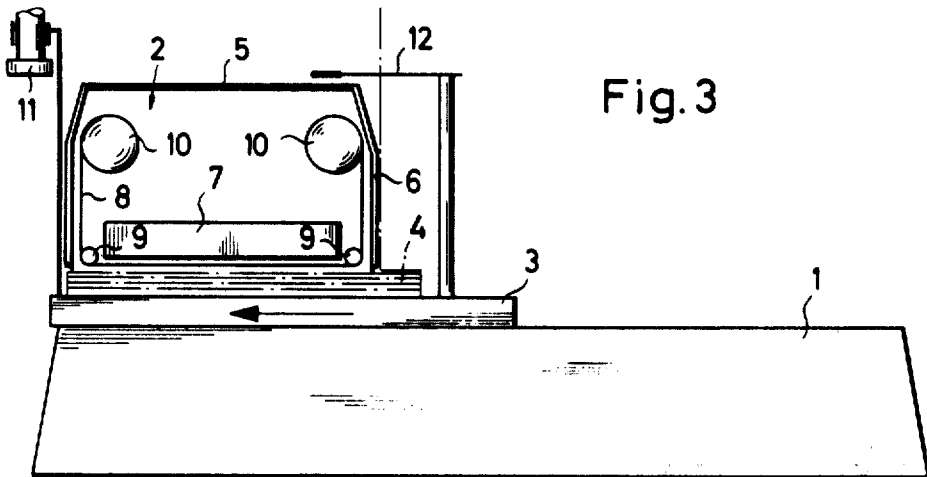


Fig. 3



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Fig.4

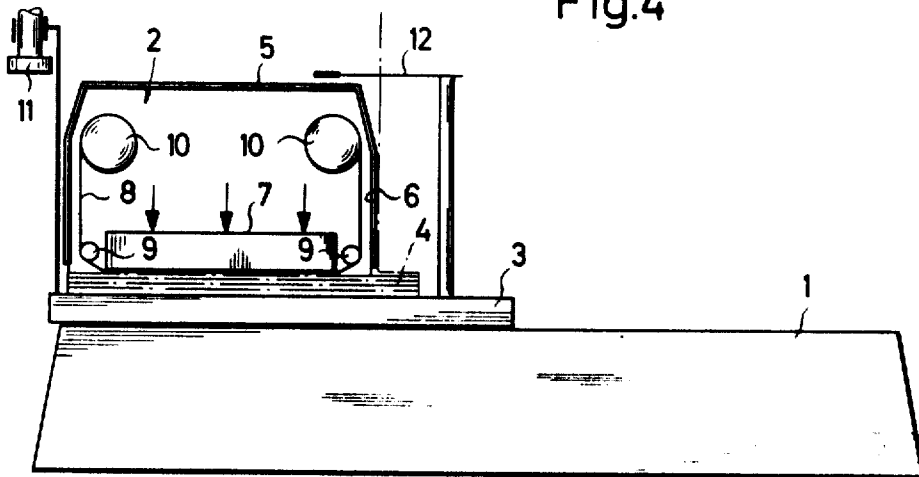
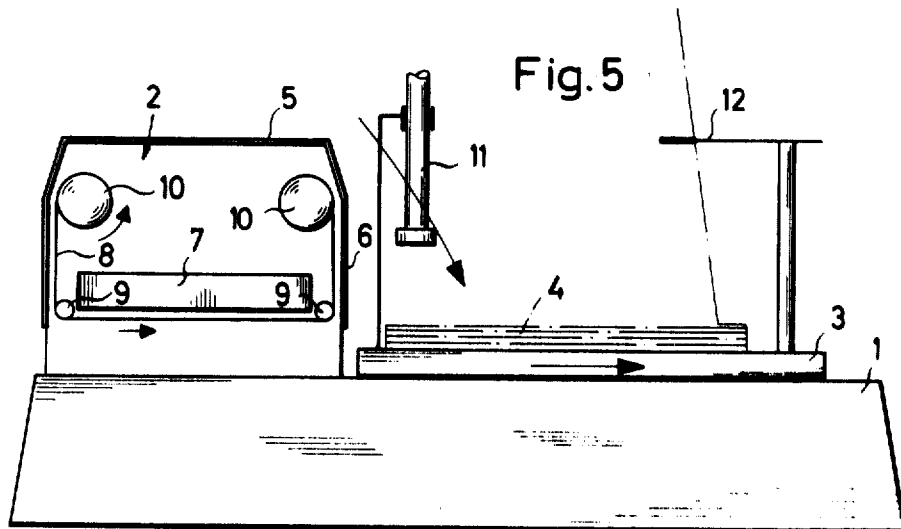
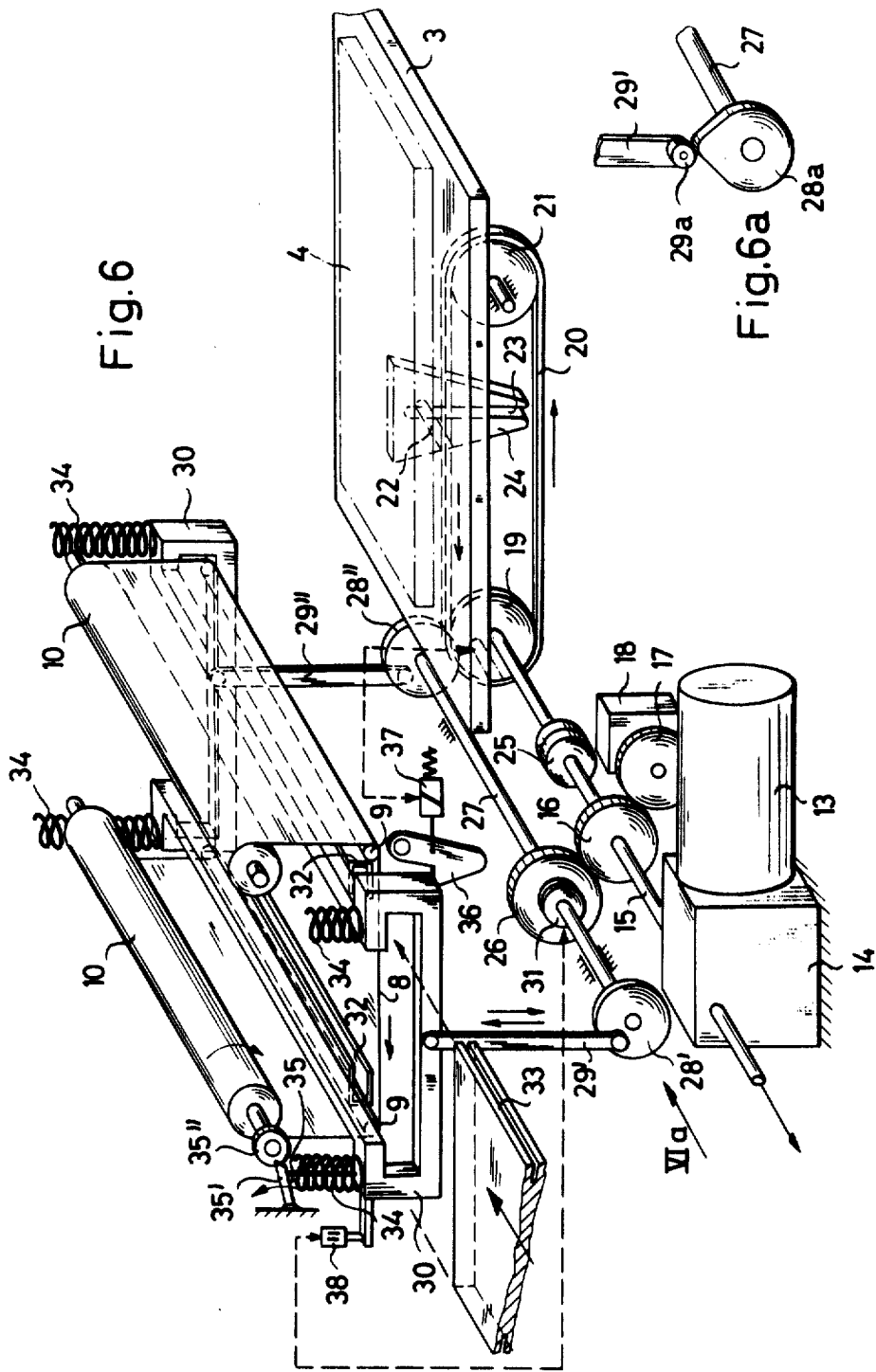
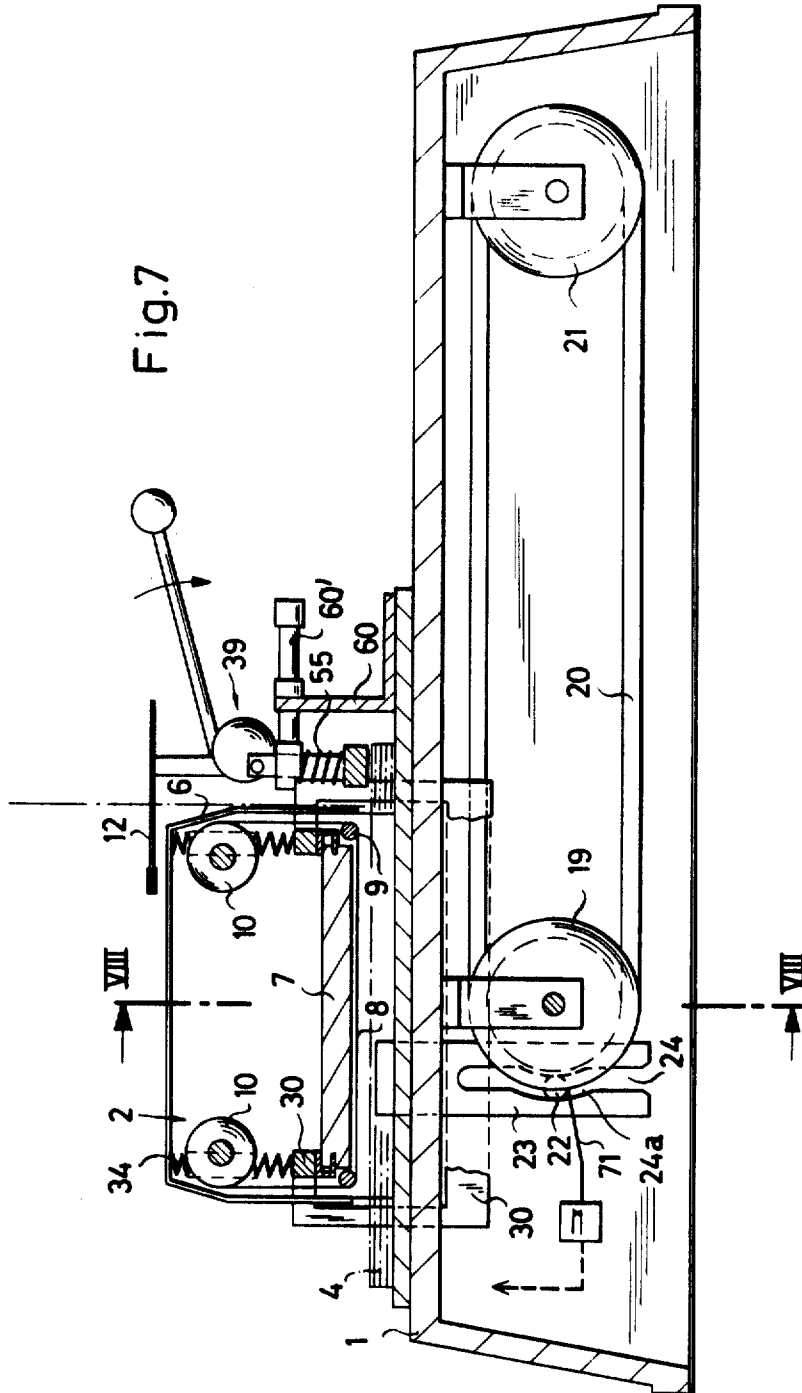
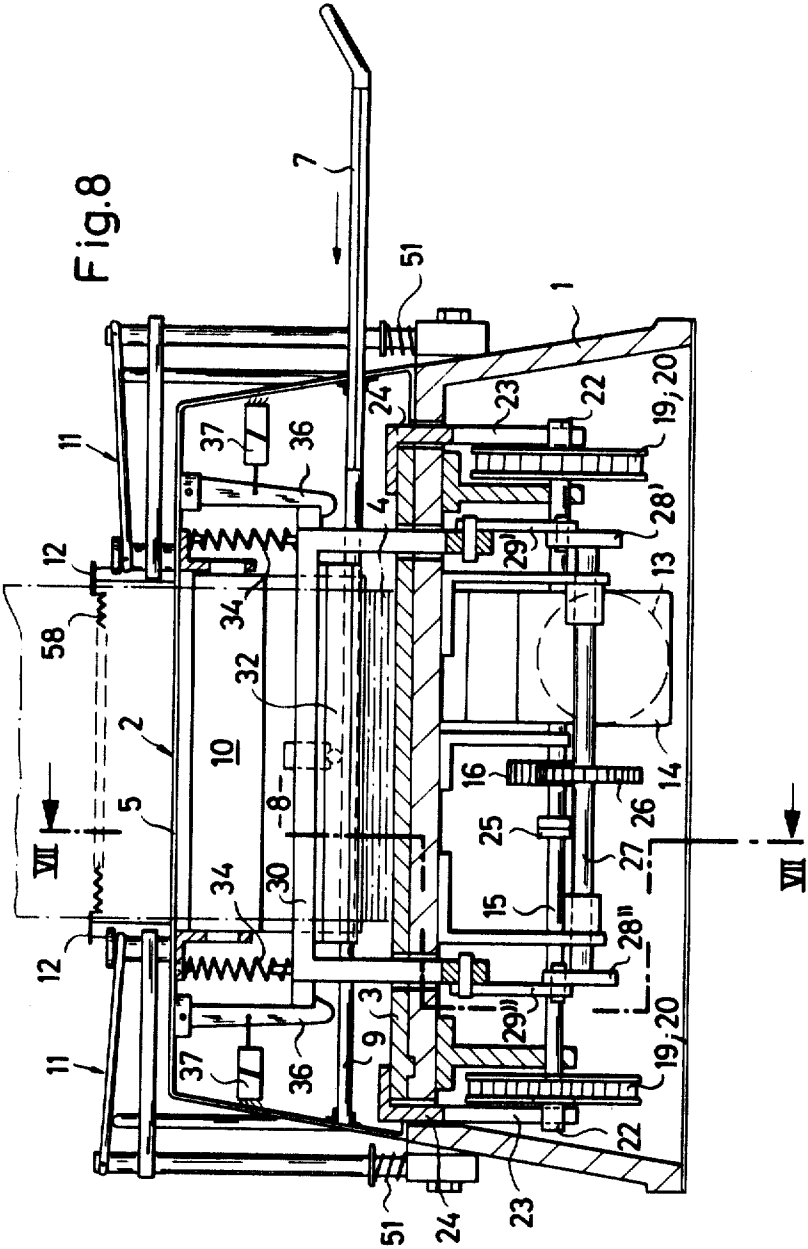


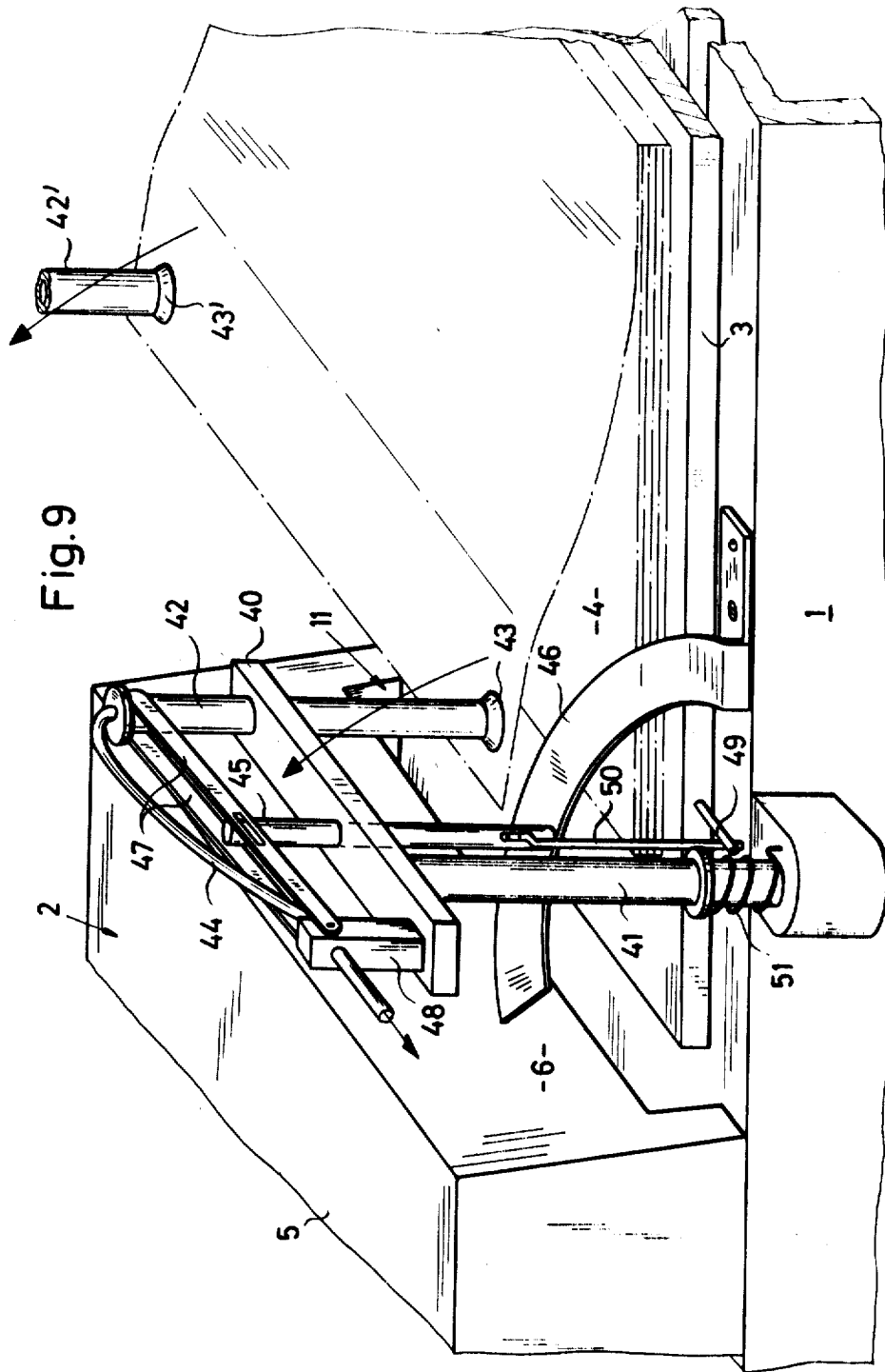
Fig.5











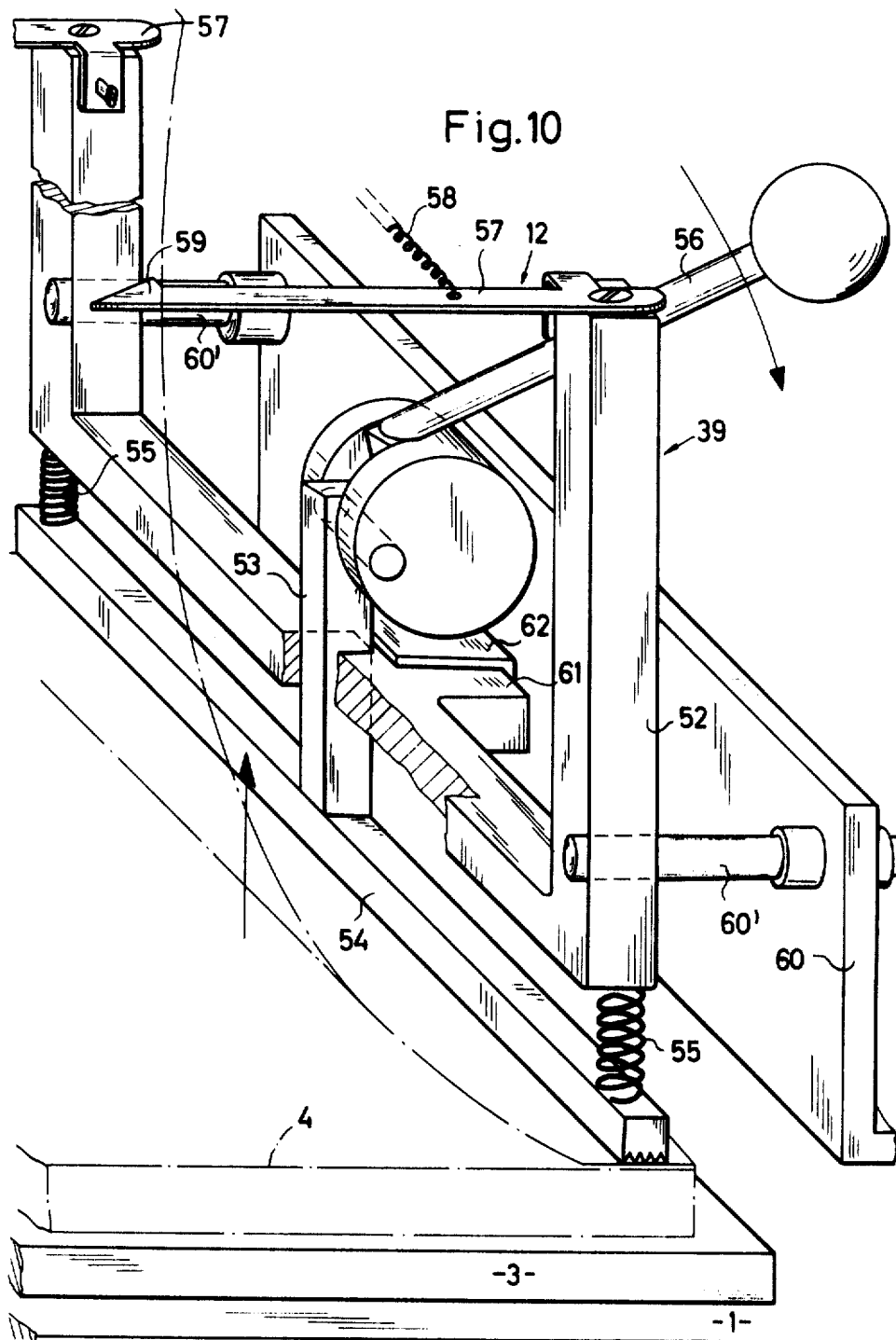
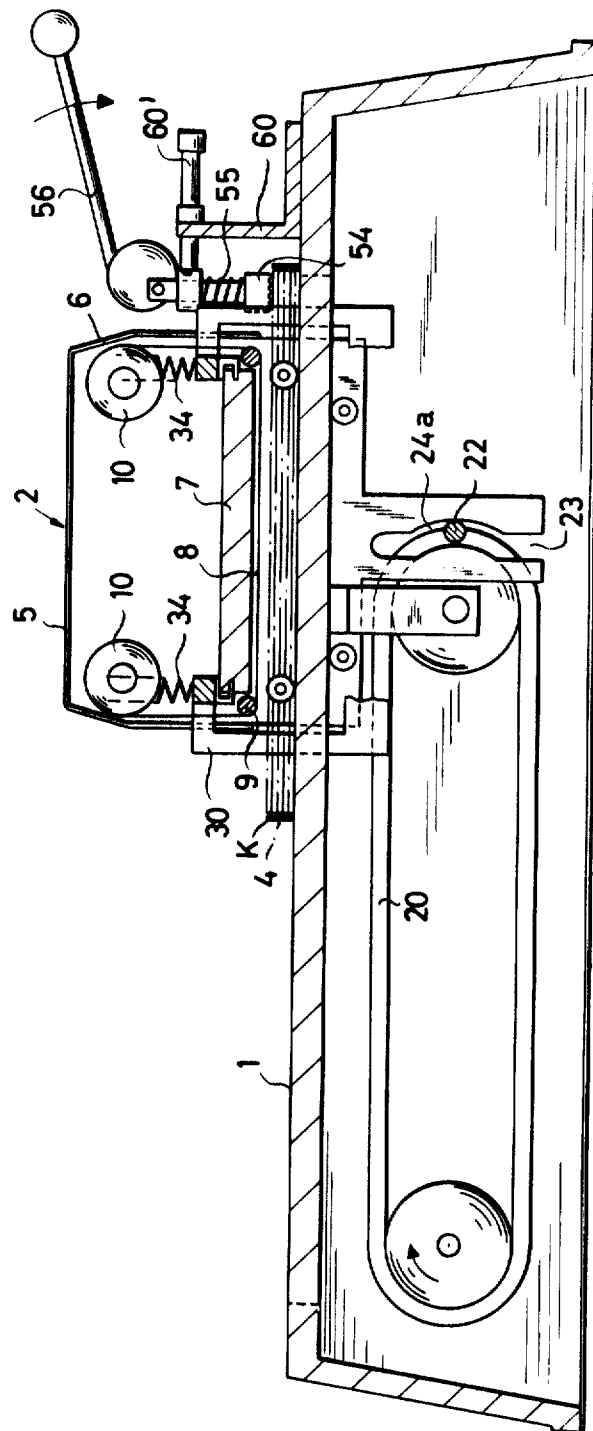


Fig.11



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APPARATUS FOR PRINTING BOUND STAPLED OR GLUED BOOKS

Description

The invention relates to an apparatus for printing bound, stapled or glued books, and more particularly check books, or other stacked sheets, wherein the individual sheets are printed successively in one end position of a reciprocating relative movement of a printing or stamping device and/or the stack of papers, taking place perpendicularly to the printing plane and are then pivoted into a position inclined or tilting relative to the printing plane.

Checkbooks and other forms, issued by banks to their customers are usually provided with the account number of the customer, which is either stamped in by hand or wherein the whole checkbook is perforated with this account number by means of a suitable device. This latter method is particularly advantageous because all individual checks of the book can be marked with the account number in one process and need not be treated individually.

However, for the past year it has been impossible to dispatch such checks with perforated numbers by mail, because the vacuum operated detector and conveyor devices of the postal services cannot handle perforated sheets. This requires the past practice of perforating checkbooks in one process to be abandoned and a large number of banks and credit institutions have adopted the practice of stamping the account numbers manually on each check. It is also usual to print in the account numbers by means of carbon papers on four or five checks or to print the loose checks first and to bind them afterwards.

Particularly the printing or stamping of the individual sheets with the account numbers has the great disadvantage of being wasteful in time and labor. The machine printing of loose checks with subsequent stapling or binding is unsatisfactory, because it is much more desirable to provide the account numbers in bound checkbooks rather than on loose checks. This is due mainly to the fact that the machine printing methods used for individual checks are not really suitable for printing the very small numbers of sheets with different customers' and account numbers. Although this drawback of very small numbers may be overcome by printing several checkbooks for each customer in addition to those ordered, this creates the expensive problem of storage of the additional checkbooks until they are needed.

Furthermore, there is also known a device which produces some savings compared with the manual overprinting of each individual sheet of a checkbook; here, the sheets need not be turned by hand after the number has been stamped on, and this movement is coupled with the upward movement of the stamping mechanism. Nonetheless, there remains the drawback that the stamping mechanism must be manually depressed for every operation, so that the time consumed is very large also in this case.

The present invention has the object of eliminating these drawbacks and of providing an improved method and an apparatus for carrying out the same, for imprinting the individual sheets of a stack, and more particularly of a checkbook, eliminating the manual work and making possible a fully automatic operation.

According to the invention, this object is realized in that either the printing or stamping device or the stacked sheets carry out a further reciprocating relative movement parallel to the printing plane and in that the printing is effected in one end position of the parallel reciprocating movement, corresponding to one end position of the perpendicular relative movement, whilst in the region of the other end position of the parallel relative movement, the individual sheets are, after the printing, raised by suction and pivoted into a plane inclined relative to the printing plane, and retained in this position.

The method according to the invention eliminates all manual work, because the printing mechanism and the paper

stack carry out two distinct relative movements, one of which is perpendicular to the printing plane and the other parallel thereto. The printing is effected in two corresponding end positions of the two relative movements. During the subsequent reversal of the two relative movements, the printing mechanism and the paper stack are disengaged and in the zone of the other end position, the printed sheet is pivoted by suction into a position which is inclined to the printing plane and retained in this position. Then the next printing starts. The raising of the printed sheet is effected usually just before, but preferably just after the other end position of the parallel relative movement has been reached.

For carrying out the perpendicular relative movement, either the printing or stamping device, or the stacked sheets are moved perpendicularly to the printing plane. For carrying out the parallel relative movement, either the printing or stamping device, or the stacked sheets are moved parallel to the printing plane.

In an embodiment of the invention, only the printing or stamping mechanism carries out the perpendicular relative movement, whilst the stacked sheets are arranged stationarily perpendicularly to the printing or stamping device and carry out alone the parallel relative movement and the printing or stamping device is stationary parallel to the stacked sheets.

It may be of advantage to effect the parallel as well as the perpendicular relative movement only by means of the printing or stamping mechanism, in which case the stacked sheets are stationary with regard to both these directions.

Conveniently, the printing plane and the plane of the stacked, unprinted sheets is a horizontal plane.

In a particular embodiment of the invention, the horizontal movement of the printing or stamping mechanism is used for pivoting the individual sheets after the printing into a position, inclined at least at 45° relative to the horizontal plane.

In another embodiment, after the printing, raising and pivoting, the individual sheets are retained in a vertical position.

In yet another embodiment, the stacked sheets are firmly clamped down on the side opposite the printing or stamping mechanism.

An apparatus for carrying out the method of the invention is characterized in that the printing or stamping mechanism and/or the stacked sheets are each adapted to carry out the said relative reciprocating movements parallel and perpendicularly to the printing plane by means of slides or other devices; in that there is provided a control mechanism for controlling the two relative movements in such a manner that the printing is effected in one end position of the relative parallel movement, corresponding to the one end position of the perpendicular relative movement; in that there is provided a suction device which raises the individual sheets after the printing in the zone of the other end position of the relative parallel movement; and comprising further a holding mechanism which holds the individual sheets after they have been lifted, in a position inclined relative to the printing plane.

For carrying out the perpendicular relative movement, either the carriage for the printing mechanism, or the carriage for the stacked sheets are displaceable perpendicularly to the printing plane. For carrying out the parallel relative movement, either the carriage for the printing mechanism, or the carriage for the stacked sheets are displaceable parallel to the plane of printing.

In an embodiment of the invention, the carriage of the printing mechanism is displaceable perpendicularly to the printing plane for carrying out the said perpendicular relative movement, and the carriage for the stacked sheets is displaceable parallel to the printing plane for carrying out the said parallel relative movement.

In another embodiment, two distinct carriages are associated with the printing or stamping mechanism, one being displaceable parallel to the printing plane and the other perpendicularly thereto.

Preferably, the carriage making the relative movement perpendicularly to the printing plane is vertically movable, and in this case the printing plane and the plane of the stacked sheets are horizontal.

In another embodiment of the apparatus according to the invention, a housing wall of the printing or stamping mechanism, facing the stacked sheets, is provided with a stripper edge providing a mechanical support for the sheets raised by suction which are then pivoted into the said inclined position by means of the said housing wall.

In another embodiment of the invention, the individual sheets are retained, after the printing, raising and pivoting, in the vertical position by the holding device.

Preferably, the holding device cooperates with a clamping mechanism, whereby the sheets are clamped down on the side opposite the printing or stamping mechanism.

The invention will be further described, by way of example, with reference to the accompanying drawings, showing preferred embodiments thereof, and in which:

FIG. 1 is a diagrammatical side elevation of a first embodiment, wherein the printing or stamping mechanism is movable in a vertical plane and the paper stack (or checkbook) in a horizontal plane;

FIG. 2 is a schematical side elevation of the FIG. 1 arrangement, showing the position during the raising of a sheet by the suction device;

FIG. 3 is another schematical side elevation of the FIG. 1 arrangement, with the checkbook in the printing mechanism and located in the zone of one end position of the parallel relative movement;

FIG. 4 is yet another schematical side elevation of the FIG. 1 arrangement, showing the timing and positioning of the printing;

FIG. 5 is a further schematical side elevation of the FIG. 1 arrangement in a position, in which the checkbook has been moved into the other end position of the parallel relative movement, outside the operating zone of the printing mechanism, and the topmost, last-printed sheet has been pivoted upwards into a substantially vertical position;

FIG. 6 is a perspective view of the actuating and driving means of the arrangement according to FIG. 1;

FIG. 6a shows a preferred embodiment of the eccentric drive for the perpendicular relative movement;

FIG. 7 is a longitudinal cross section of the FIG. 1 arrangement along the line VII-VII in FIG. 8;

FIG. 8 is a cross section of the FIG. 1 arrangement along the line VIII-VIII in FIG. 7;

FIG. 9 is a partial view of the FIG. 1 arrangement in perspective and shows the clamping device on an enlarged scale;

FIG. 11 shows, in longitudinal cross section and partly broken away, a second preferred embodiment of the invention, in which the checkbook or paper stack is stationary and the printing mechanism is displaceable both horizontally and vertically.

FIGS. 1 to 5 illustrate the principle of the method according to the invention and the operation of a preferred embodiment of the apparatus for carrying out this method.

A frame 1 carries a printing and stamping mechanism 2 or carriage 3. This carriage 3, or moving table, supports a stack of sheets bound to form a book, such as a checkbook 4. The printing and stamping mechanism 2 has a housing 5, the outer wall of which facing the checkbook 4, forms a guide face 6. Inside the housing, which is firmly connected to the frame 1, there is a printing plate 7, displaceable vertically relative to a horizontal printing plane, and effecting, during the vertical displacement, a reciprocating movement relative to the horizontal plane. Under the plate 7, there is a color ribbon (e.g., a carbon ribbon) 8, passing over two spindles 9 and two further spindles 10.

The table 3 carrying the checkbook 4 forms a carriage, and is displaceable in the horizontal plane, that is to say, parallel to the printing plane, so as to carry out the parallel relative movement. A suction device 11 is arranged in the zone of the

checkbook 4 adjacent to the printing mechanism, and serves to raise the individual sheets after they have been printed. As will be explained further below, the suction device is adapted to be pivoted and may be moved outside the region of the parallel movement of the table 3.

A retaining device 12 is provided which holds the individual sheets, after the printing, in the vertical position.

The main directions of movement of the printing plate 7, of the checkbook 4 and of the individual sheets after the printing are indicated by arrows.

The preferred embodiment of the apparatus for carrying out the method according to the invention and illustrated in FIGS. 1 to 5 operates as follows:

In the FIG. 1 position, the printing plate 7 and the checkbook 4 with the carriage 3 are each in one of the two end positions of the two relative movements, i.e., the plate 7 is in the upper end position (of the vertical relative movement), and the checkbook 4 with the carriage 3 is in the right-hand end position (of the parallel relative movement) outside the operating range of the printing and stamping mechanism 2. In the position illustrated in FIG. 1, the topmost sheet of the checkbook 4, which has just been printed by the printing plate 7, is gripped by the suction device 11 and raised, as shown in FIG. 2. During the raising, which may be effected in the right-hand end position of the checkbook, or shortly after this position has been reached, the book 4 is displaced by the carriage 3 towards the printing mechanism 2. During this horizontal movement parallel to the printing plane, the topmost sheet, provided with the imprint, is deflected towards the top by the right-hand outer wall of the housing 5, forming a guide face 6 and reaches finally the preferably U-shaped retaining device 12 in a substantially vertical position, when the checkbook 4 with the carriage 3 have fully entered the printing mechanism 2. During the movement of the checkbook 4 into the housing 5 of the printing mechanism 2, the suction device 11, consisting preferably of two arms, is swiveled upwardly and towards the side. At the end of this movement, the suction device 11 is outside the range of the parallel displacement and in the position shown in FIG. 3. This pivoting of the suction device towards the top and side has proved to be particularly convenient.

The printing is effected at the end of the relative parallel movement between the printing mechanism and the checkbook. It should here be stressed that the printing takes place exactly in the reversing point of the horizontally reciprocating relative movement of the checkbook 4, because otherwise no perfect impression can be achieved. Preferably, the standstill time at the reversing point, which is infinitely short with a continuous reciprocating movement, is extended, as described in greater detail further below. After the printing, the printing plate 7 is displaced upwardly and starts a part of its vertically reciprocating relative movement. This upward movement of the plate 7 releases the checkbook 4 and the same is moved by the carriage 3 into its right-hand end position, as shown in FIG. 5. During this movement, the suction device 11 is swiveled back into a position above the end of the checkbook 4 adjacent to the printing mechanism.

The operating position of FIG. 5 is then again followed by the FIG. 1 position, and the operating cycle is repeated until every individual check in the checkbook, which is bound at the end remote from the printing mechanism, has been provided with the desired imprint.

FIG. 6 of the drawing shows the actuating, displacing and printing means of the arrangement according to FIGS. 1 to 5.

The whole apparatus is driven by a single motor 13, the power being transmitted via a gearing to a main shaft 15. The shaft 15 drives a suction pump 18 through gears 16, 17. At both ends of the shaft 15 and on both sides of the centrally mounted motor 13, there are two sprockets, of which only one, the sprocket 19, is shown in FIG. 6. Both sprockets 19 are equipped with associated chain drives, of which again only one is shown in the drawing and described in the following.

The sprocket 19 carries an endless chain 20 which passes also over a second sprocket 21. The chain 20, revolving in a vertical plane, has a horizontal follower pin 22 which engages into a slot 23 of a follower bracket 24. The bracket 24 is mounted on one of the longitudinal sides of the table 3 and causes thereby during the running of the chain 20 the displacement of the table 3, i.e., a reciprocating movement thereof. As already mentioned, an identical drive mechanism is provided in symmetrical arrangement on the other long side of the table so that an eccentric point of attack of the driving effort is avoided. However, it is also possible within the frame of the invention to provide a single, center-mounted follower.

Between the two gears 16 and 19, the shaft 15 has mounted thereon a coupling 25 operating in conjunction with a quick-action stop for the carriage 3.

The gear 16 meshes with a further gear 26 and drives via a shaft 27 two crank wheels 28' and 28''. Two connecting rods 29' and 29'' are eccentrically mounted on the crank wheels 28' and 28'' and are articulately connected with a frame 30.

Adjacent to the gear 26, there are two actuatable separating couplings, for example, electromagnetic couplings 31, of which only one is shown in the drawing. When these couplings 31 are actuated, the two crank wheels 28' and 28'' are disengaged from the motor 13, as described in detail further below.

Two guide rails 32 are arranged in the frame 30 and the printing plate 7, equipped with a corresponding slot 33, can be fitted into these rails. Under the printing plate 7 is the inking ribbon 8, passing over rollers 9 and reeled on to the two upper rollers 10 during the upward movement of the printing plate.

Compression springs 34 are mounted at the top corners of the frame 30 and rest with their other, upper ends, on fixed abutments. Underneath the frame 30 there are, in the regions of the corners, four ratchet pawls 36 (only one of which is shown); each pawl 36 is associated with a spring-loaded electromagnet 37.

A pin 35 is mounted on the top of the frame 30 and moves in its top dead center position a ratchet pawl 35' so that a ratchet wheel 35'' advances the shaft 10 and with it also the ribbon 8 by a small amount, so that the ribbon is continuously renewed.

The frame 30 cooperates with a microswitch 38, the object of which will be explained further below and which releases the electromagnetic coupling 31, when the frame reaches its topmost position.

The arrangement illustrated in FIG. 6 operates as follows:

Due to the continuously operating motor 13, the gearing 14, the shaft 15 and the gears mounted thereon, cause the chain 20 to revolve continuously. During each revolution, the pin 22 mounted on the chain 20, carries a reciprocating to-and-fro movement which is transmitted to the carriage 3 with the checkbook, owing to the sliding engagement of the pin 22 in the slot 23 of the follower 24. Hence, the carriage 3 with the checkbook 4 carries out a horizontally reciprocating movement parallel to the printing plane.

By means of the eccentric drive 28', 28'', 29', 29'', the frame 30 with the printing plate 7 is pushed into its topmost end position, causing the compression springs 34 to be compressed. When the upper end position has been reached, the frame 30 engages with its underside on the four spring-loaded ratchet pawls 36, which then carry the frame 30 with the printing plate 7 and also take up the force exerted on the frame 30 by the compression springs 34. When the frame 30 and the printing plate 7 reach this upper end position, the microswitch 38 is energized, causing the two electromagnetic couplings 31 to be released, breaking the positive connection between the eccentric drive of the frame 30 and the motor 13.

During the upward movement of the frame 30 with the printing plate 7, the carriage 3 with the checkbook moves during its reciprocating movement into a position below the printing plate 7. When the carriage 3 with the checkbook 4 has reached its left end position, in which it is momentarily stationary, a further microswitch 71 (see FIG. 7), controlled, for example, by the follower pin 22, energizes the electromagnets

37 of each locking pawl 36, causing these to be attracted and to be withdrawn from the locking position. Hence, the frame 30 with the printing plate 7 is suddenly released and forced downwards by the four compression springs 34. The printing is effected in the bottom end position of the printing plate 7, corresponding to the left end position of the horizontally reciprocating movement of the carriage 3 and checkbook 4.

As soon as the printing is effected, further microswitches, not shown, cause the two electromagnetic couplings to be energized, and the reestablished driving connection with the motor 13 causes the frame 30 with the printing plate 7 again to be moved upwardly by the eccentric drive 28', 28'', 29', 29''. Simultaneously, the carriage 3 with the checkbook 4 is again moved into its right-hand end position, whilst the topmost, printed, sheet, passes outside the operating range of the printing mechanism and can then be pivoted out of the plane during the next leftward movement of the carriage 3.

FIG. 6a shows another, particularly preferred construction of the eccentric drive for the vertically reciprocating movement of the frame 30 and pressure plate 7. In this construction, the two crank wheels 28' and 28'' are replaced each by a cam plate 28a. A roller 29a is in rolling engagement with the cam plate; this roller is arranged at the ends of the two connecting rods 29', 29''.

The cams of the cam plate 28a cause the displacement in an upward direction of the associated connecting rod 29' with its roller 29a and the frame 30 with the printing plate 7 is moved into its top end position, in which the four locking pawls 36 are in engagement. After the top end position has been reached, the cam plate 28a continues to revolve under the roller 29a without making contact therewith, so that the two electromagnetic couplings 31 and the microswitch 38 can be omitted.

The cam drive is so adjusted relative to the other actuating members that the cam plate 28a makes contact with the actuating rollers 29a only after the termination of the next printing cycle, i.e., that there is no contact between the roller 29a and the cam plate 28a during the remaining period.

Further details of the arrangement shown in perspective in FIG. 6 may be seen from FIG. 8, showing a cross section, illustrating more particularly the symmetrical configuration of the drive mechanism for the carriage 3 and the printing plate 7.

FIG. 7 is a longitudinal cross section of the apparatus, shown partly diagrammatically. As shown, the right end of the carriage carries a clamping device 39, whereby the back of the checkbook is clamped tight. Further details of the clamping device are shown in FIG. 10 of the drawing.

FIG. 7 also illustrates a particularly preferred embodiment of the follower 23, wherein the slot 24 has a center section 24a of arcuate configuration. With the checkbook in the left-hand end position, i.e., in the printing position, the follower pin 22 is substantially in the center of the arcuate section 24a. In this way, the infinitely short period of time, during which the carriage remains in the left dead center position, and is thus stationary, is increased to a finite value during which the printing is carried out. This arcuate configuration of the center section of the slot 23 makes it possible in a particularly simple manner to increase the standstill period of the carriage in the left reversing point to such an extent that the printing is not impaired and a clean imprint may be guaranteed.

When, during the further movement of the wheel 19, the pin 22 passes from the arcuate section 24a in the adjacent straight section, the follower 23 and the carriage 3 are again entrained and displaced towards the right-hand end position. However, prior to that, the printing plate 7 has already been lifted off the checkbook so that its movement is not restricted by the printing plate.

When the carriage 3 with the checkbook 4 is moved from the right-hand end position into the left-hand end position according to FIG. 7, the sheet imprinted immediately before is gradually raised by the wall of the housing 5 of the printing mechanism 2, acting as deflector guide 6 until it reaches a substantially vertical position. Preferably, the horizontal relative

movement parallel to the printing plane is used for deflecting the printed sheets. Then, the printed sheets are held by the retaining device 12 in a substantially vertical position; to this end, two legs are provided which hold the sheets on both sides.

FIG. 9 shows the suction device 11 in perspective and on an enlarged scale. This device 11 consists substantially of two suction arms 40 arranged symmetrically relative to the checkbook 4 and the carriage 3. The suction arm 40 is adapted to pivot about an axis 41 and carries at its end remote from the axis of rotation 41 a vertically displaceable suction pipe 42 with a rubber suction cup 43. The upper end of the suction pipe 42 is connected to a hose 44, leading to a suction pump 18, shown in FIG. 6.

A vertically displaceable plunger 45 extends through a hole in the suction arm 40. The lower end of the plunger 45 rests on a sliding track 46 of arcuate configuration and curved towards the top. The track 46 is firmly mounted on the frame 1, such as by screws or the like.

The upper end of the plunger 45 is articulately connected with two levers 47 which are hinged at one end to a vertical column 48, firmly connected to the arm 40 on its upper surface. The other ends of the two levers 47 rest loosely on the upper edge of the suction pipe 42 which is vertically displaceable in a hole in the arm 40.

The carriage 3 has a horizontal follower pin 49, cooperating with a further follower 50 and causing the arm 40 to pivot about its axis 41, when the carriage is moved. This leftward pivoting takes place against the action of a helical spring 51.

The suction device just described operates as follows:

When the carriage 3 with the checkbook 4 is in the right-hand end position, the topmost sheet just printed is gripped, at the start of the movement, by the two suction cups 43 and retained. During the further movement of the carriage 3 towards the left, the arm 40 is pivoted about its axis 41 by the followers 49 and 50. The lower end of the plunger 45 slides along the track 46, causing the plunger to be pushed up. This causes the lever 47 to pivot and the suction pipe to move vertically upwardly. Thus, the two suction cups 43 and 43' carry out a spiral, upwardly directed movement, during which the retained, printed, topmost sheet is raised and finally erected by the wall of the housing 5 of the printing mechanism into a substantially vertical position. Prior to this positioning in the vertical position, the two suction cups 43 and 43' have left the sheet during their spiral movement and assumed the FIG. 3 position.

By way of modification of FIG. 9, the suction pipes may also operate without pivoting movement; in this case, the right outer housing wall is preferably provided with a horizontal guide plate projecting therefrom, which mechanically supports the topmost sheet, after the same has been lifted by suction.

An optical barrier may be provided in the zone of the stacked sheets, e.g., near the suction device, for counting the raised sheets, and this may also be used for counting banknotes.

FIG. 10 shows the clamping and retaining device in perspective and on an enlarged scale.

The clamping device 39 is equipped with a U-shaped member 52. A center part 53 of a T-shaped member 54 is vertically movably guided in a horizontal web of the member 52. Between the ends of the T-member 54 and the U-member 52, there are strong compression springs 55, whereby the T-member 54 is pressed with its underside against the back of the checkbook 4 and clamps the same down. By means of an eccentric lever 56, articulated to the center part 53, the T-member may be pulled in an upward direction against the force of the springs 55, releasing the checkbook 4 and enabling a new book to be inserted.

A strong angle profile 60, with two strong horizontal guide bars 60', is firmly connected with the main frame 1. These retain the U-shaped member 52 and guide the same horizontally displaceably. Thus, the entire clamping device can be shifted longitudinally of the carriage 3 and be adapted thereby to different sizes of checkbooks or the like.

Preferably, the center web of the U-shaped member 52 has a lug 61 in sliding engagement with an angle member 62 or the like, mounted on the angle profile 60. This increases the stability of the clamping device and enables large clamping forces to be applied.

By means of the clamping device shown in FIG. 10, large clamping forces may be applied to the checkbook, supporting the easy running of the printing mechanism. The clamping device may be connected to the carriage by any means known in the art so that the checkbook remains reliably fixed during the whole duration of the printing process.

Two legs 57 are mounted horizontally pivotably at the upper ends of the lateral vertical webs and form the holding device 12 for the printed and raised sheets.

A soft tension spring 58 is mounted between the two legs 57, pulling these two legs together with a certain small tension, enabling the holding of the raised sheets to be improved. The left ends of the legs 57 have barbed points 59, preventing in a very simple manner the raised sheets from dropping from the vertical position.

FIG. 11 of the drawing shows a second preferred embodiment of a device for carrying out the method according to the invention, in which both the perpendicular and the parallel movements are effected by the printing mechanism. Here, the checkbook 4 with the clamping and retaining devices are mounted stationarily on the frame 1, whilst the housing 5 is moved reciprocatingly in the horizontal plane. The printing plate 7 is mounted within the housing 5 vertically displaceably for carrying out the vertical relative movement, as described above.

The printing rate of the fully automatic apparatus according to the invention is about 100 sheets per minute.

The method and apparatus according to the invention have the following substantial advantage.

In the future, check and account numbers will be applied generally in coded lettering, e.g., in the so-called OCRA lettering, wherein the scanning of checks will be effected by automatic readout devices, operating preferably on an optical basis. In this automatic readout, it is important that every individual coding sign occupies an exact, predetermined position on the check. This accuracy cannot be achieved if the coding is applied manually and is possible only by means of the automatic printing system according to the invention.

Since future, automatic readout devices will preferably operate on an optical basis, a sharp contrast is necessary for the coding symbols to be read; also this cannot be achieved successfully by manual overstriking. Of special importance is that, according to the invention, a special carbon ribbon is used; these ribbons are known to supply a higher contrast than can be achieved with manual stamping, using a pad. Another advantage is that the ribbon is advanced after every printing cycle through a certain amount so that always new parts of the ribbon are used, whilst the used parts are discarded.

In connection with the requirement of good lettering contrast, also the printing pressure is important, because the contrast improves with the printing pressure. Whilst, with manual operation, there are natural limits in the magnitude of the printing pressure, the required pressure can be easily supplied by the automatic operation according to the invention.

A further advantage is the closed box or cassette K supplied for the loose checks, and open toward the top for the action of the clamping device. In this way, a stack of loose, unbound checks may be placed into the cassette, whilst the individual checks are well guided, the the coding symbols are always printed in the same, correct, position. Working with these loose checks is important, particularly in view of the automatic readout devices which will be used in the near future.

I claim:

1. An apparatus for printing stacked sheets, particularly bound, stapled or glued sheets, such as checkbooks, comprising:
 - a frame;
 - a first operative unit comprising a printing apparatus having a housing provided with an opening and printing means

for reciprocating displacement in the housing perpendicular to a plane defined by the stacked sheets to effect printing, and said opening being larger than the cross-sectional area of the stacked sheets;

a second operative unit comprising holding means for holding the individual sheets after printing in a position inclined with respect to the plane of the stacked sheets; clamping means for clamping said stacked sheets to said second unit along the edges thereof remote from the housing;

suction means for drawing up and lifting the uppermost sheet of the stacked sheets after printing;

means for swinging and inserting into the holding means the printed sheets which have been drawn up and lifted by the suction device, said means including an outer wall of the housing adjacent the stacked sheets;

and carriage means movable on said frame and having one of said operative units mounted thereon, means to impart to said carriage means a movement along said frame parallel to the plane of the stacked sheets and limited by two end positions defined by the first operative unit on the one hand and the second operative unit on the other hand, in one end position said stacked sheets extend through the opening in the housing into alignment with the printing means for printing the topmost sheet of the stacked sheets while in the other end position the stacked sheets lie completely outside the housing;

suction means for drawing up and lifting the printed uppermost sheet of the stacked sheets;

and means for swinging and inserting into the holding means the printed sheets which have been drawn up and lifted by the suction device, said means including an outer wall of the housing adjacent the stacked sheets.

2. An apparatus according to claim 1, wherein the first operative unit is mounted on the carriage for carrying out of the relative movement parallel to the plane of the stacked sheets, while the second operative unit is stationary.

3. An apparatus according to claim 1, wherein the first operative unit is stationary, and the second operative unit is mounted on the carriage to carry out the relative movement parallel to the plane of the stacked sheets.

4. An apparatus according to claim 3, wherein the clamping apparatus and the holding apparatus are mounted on the carriage in the region of the edge of the stacked sheets remote from the housing.

5. An apparatus according to claim 4, wherein said suction device is responsive to movement of the carriage to be actuated thereby and after the drawing up and lifting of the topmost printed sheets to be swung outside the path of the parallel relative movement between the stacked sheets and the printing apparatus.

6. An apparatus according to claim 1, in which the plane of the stacked sheets is horizontal.

7. An apparatus as set forth in claim 1, wherein the printing apparatus comprises a frame and a printing plate detachably mounted within said frame.

8. An apparatus as set forth in claim 7, wherein the means for moving the printing apparatus reciprocatingly perpendicularly to the printing plane comprises cam drive means, compression springs and locking pawls, the frame with the printing plate being displaceable vertically upwardly by the said cam drive means, and vertically downwardly, after the release of the locking pawls, by said compression springs.

9. An apparatus as set forth in claim 7, wherein the means for moving the printing apparatus reciprocatingly perpendicularly to the printing plane comprises an eccentric drive mechanism.

10. An apparatus as set forth in claim 7, further comprising an inking ribbon resting against the underside of the printing plate and following the reciprocating vertical movement of the printing plate.

11. An apparatus as set forth in claim 1, further comprising an endless chain revolving in a vertical plane and equipped with a follower pin, said carriage means having connected thereto a follower equipped with a slot, said follower pin engaging in the slot of the follower mounted on the carriage means to move the carriage means reciprocatingly in the horizontal direction during every revolution of said chain.

12. An apparatus as set forth in claim 11, wherein said slot in the follower has a center section of arcuate configuration.

13. An apparatus as set forth in claim 1, wherein said suction device comprises two arms, each with a suction pipe, said suction pipes being vertically displaceably mounted in said arms, two arcuate guide tracks inclined to the horizontal and rising in the direction of the printing mechanism, the lower end of plungers extending through the suction arms resting against said guide tracks, a follower pin mounted on both sides of the carriage means and causing, during the horizontal movement thereof towards the printing mechanism, a pivoting of the associated arm.

14. An apparatus as set forth in claim 1, wherein the clamping device comprises a vertically displaceable T-member and compression springs biasing said T-member against the stacked sheets, and an eccentric lever, whereby said T-member is displaced in an upward direction against the force of the compression springs.

15. An apparatus as set forth in claim 14, further comprising means displaceably mounting the clamping device relative to the carriage means in the direction of movement thereof.

16. An apparatus as set forth in claim 1, wherein the retaining means comprises two horizontal legs spaced apart by an amount substantially equal to the width of the stacked sheets.

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