Aug. 20, 1935. R. REINARTZ 2,011,776

DEVICE FOR FEEDING SHEET MATERIAL TO A MACHINE, PARTICULARLY TO A PRINTING MACHINE

Filed March 18, 1935 2 Sheets-Sheet 1

Fig. 1

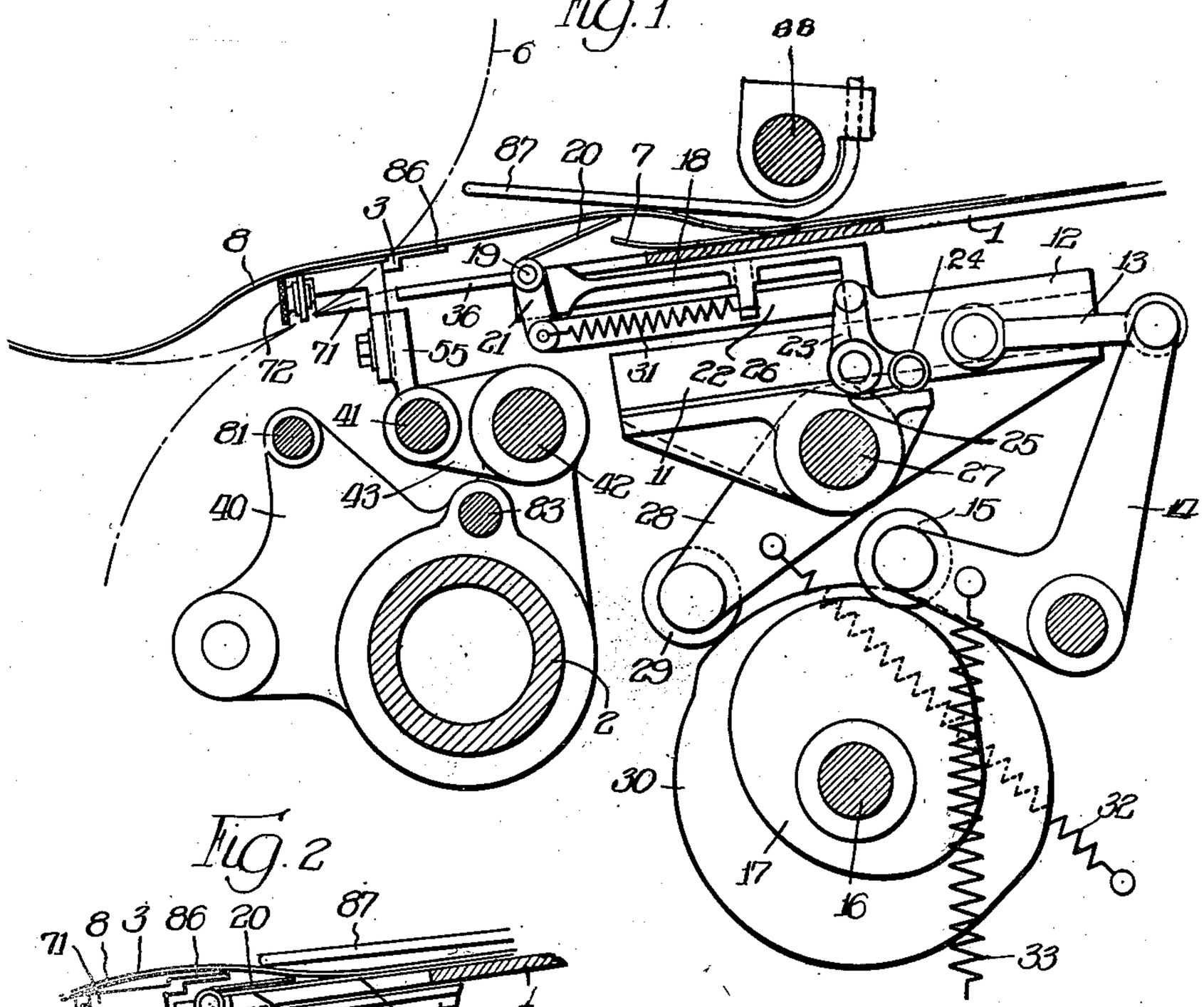


Fig. 2

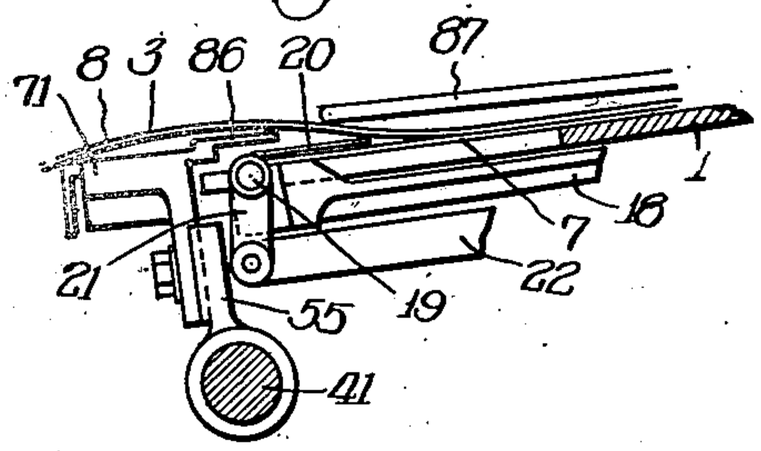


Fig. 3.

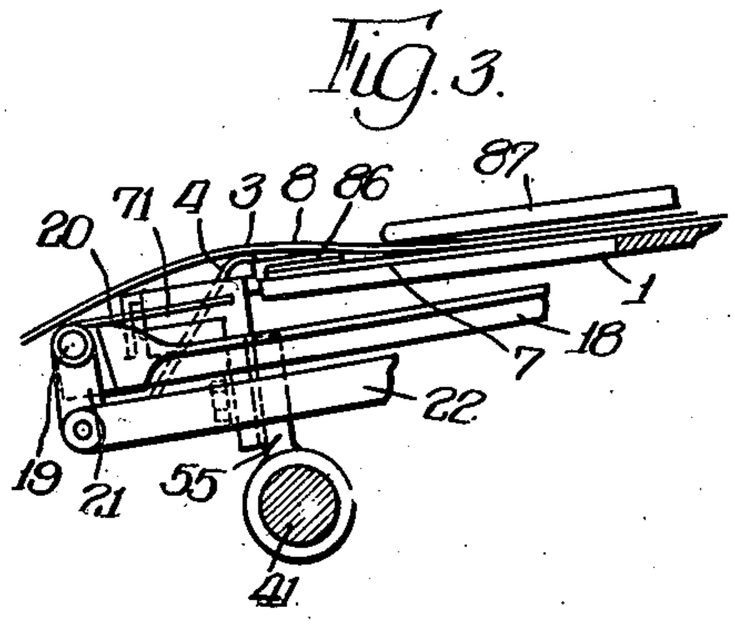
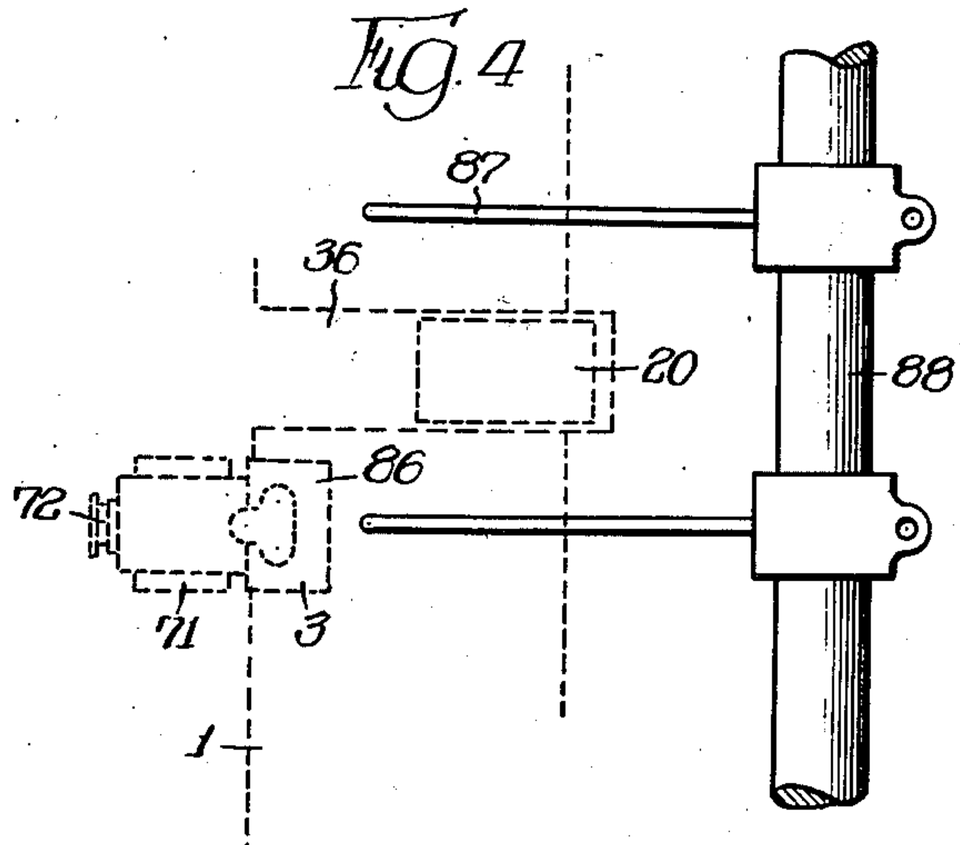


Fig. 4



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DEVICE FOR FEEDING SHEET MATERIAL TO A MACHINE, PARTICULARLY TO A PRINTING MACHINE

Filed March 18, 1935 2 Sheets-Sheet 2

Fig. 5

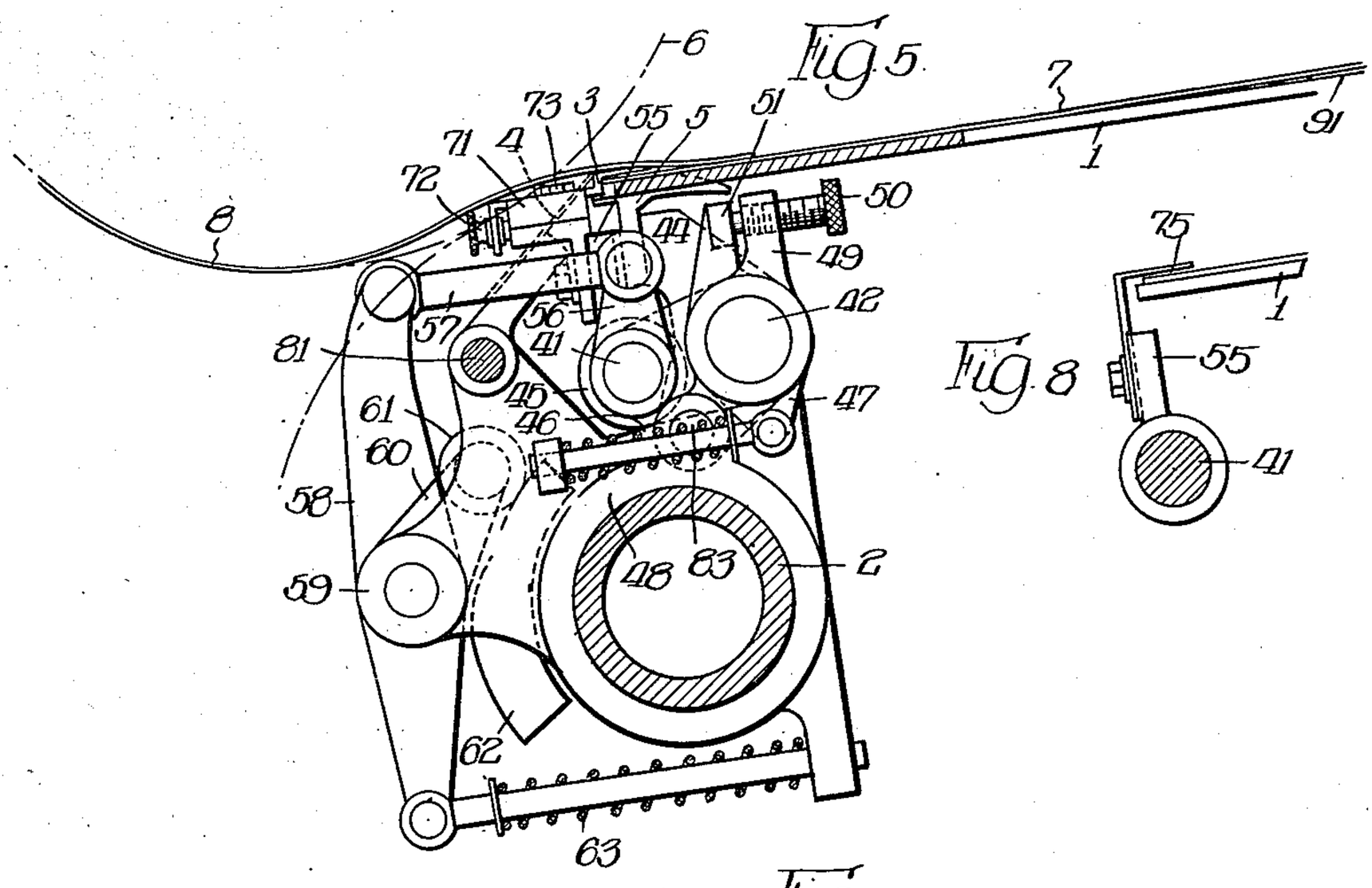


Fig. 8

Fig. 6.

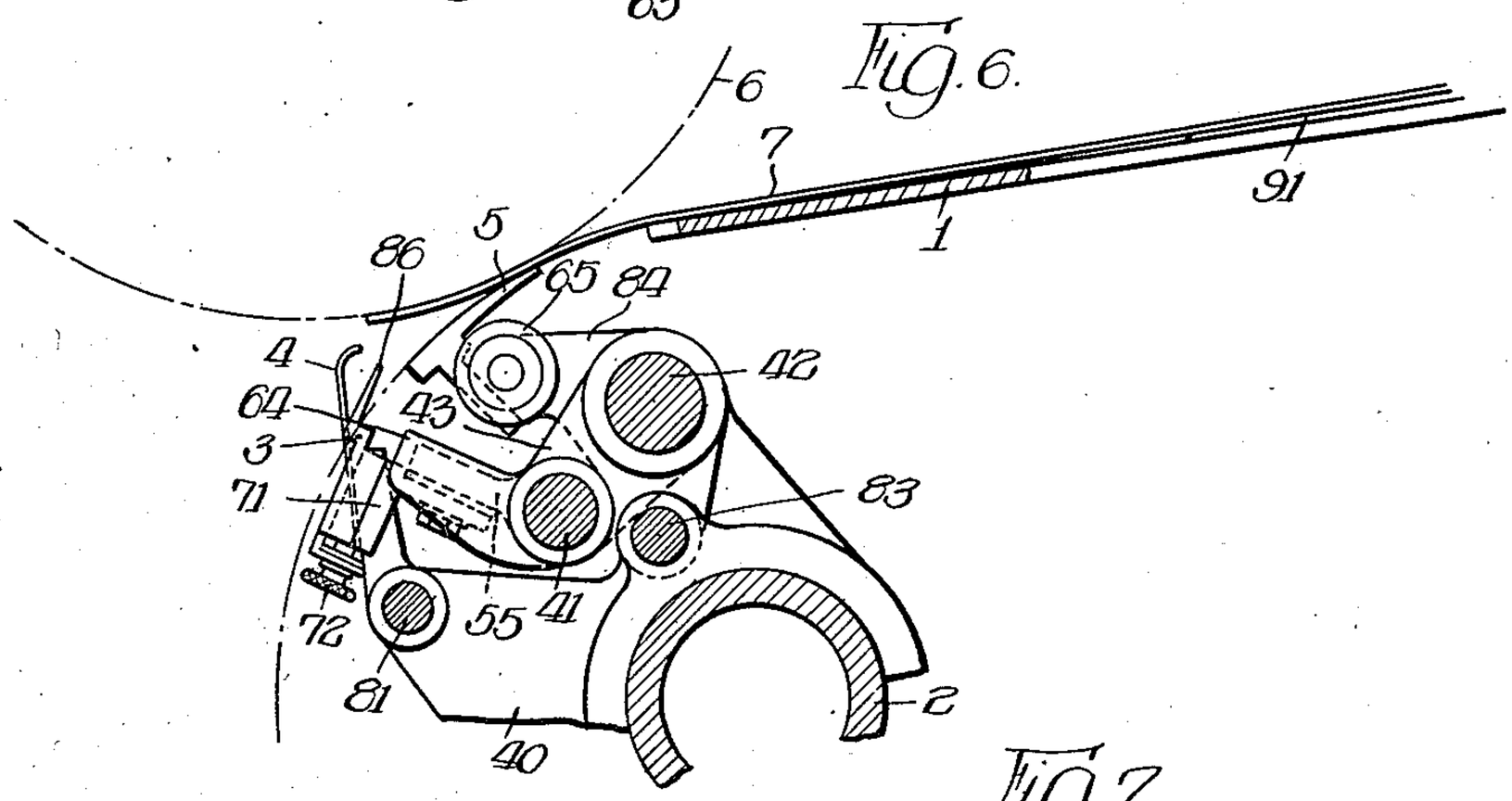
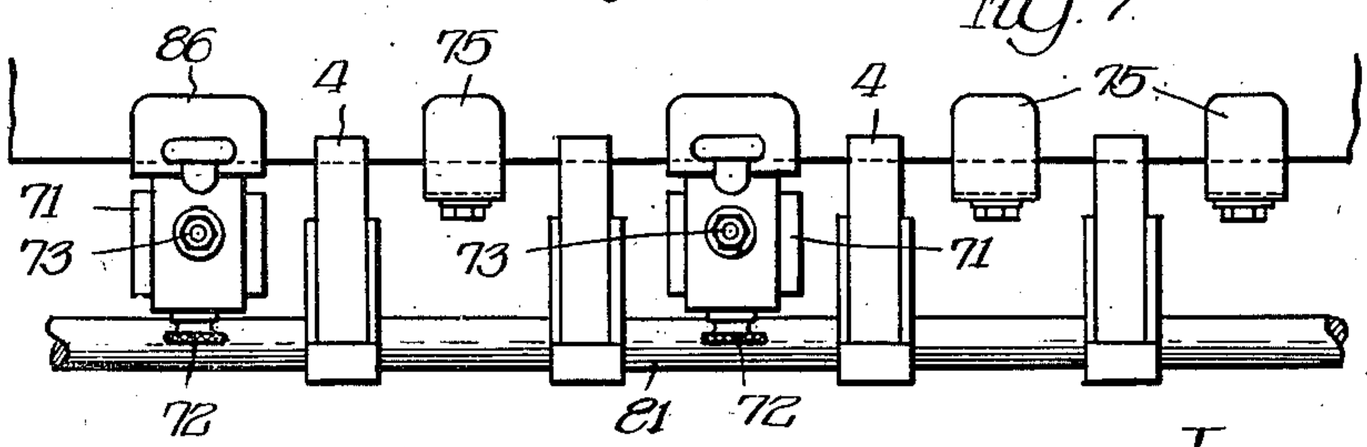


Fig. 7



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UNITED STATES PATENT OFFICE

2,011,776

DEVICE FOR FEEDING SHEET MATERIAL TO A MACHINE, PARTICULARLY TO A PRINTING MACHINE

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Application March 18, 1935, Serial No. 11,532
In Germany January 2, 1934

8 Claims. (Cl. 271—53)

In devices for feeding sheet material to a machine, it is well known to prevent the bulging of the sheets by guide-rods or similar means which smooth out the sheets and keep them flat. Such sheet controlling means have been combined with the aligning gauges, or fastened in the machine, independent of said gauges. It has also been suggested to provide such sheet controlling means on the hooks used to slow-down the sheets before they meet the front gauges.

Such existing means however cannot be used with advantage when the sheets pass over the feed table in overlapping relation to one another, because in such cases the means provided over the sheets cannot act immediately on the sheet being aligned, and means, such as known heretofore, would interfere with the motion of the overlapping sheet.

My invention relates to a device in which the sheets are also prevented by guide-rods from bulging when they are caught by cover plates, hooks, or front gauges. In addition to the front gauges provided in the usual manner with cover plates to catch and align the sheets, guide rods are arranged over the front gauges, which rods press down the overlying sheet which is either being aligned or passing away from the feed table and thus acts mediately on the next underlying sheet, assuring that this sheet properly enters into engagement with the aligning organs. The invention also provides that the organs which are arranged under the overlying sheet and serve to align the next or underlying sheet—such as cover plates combined with the front gauges, or cover plates arranged between said front gauges, and hooks for slowing down the speed of the sheets—are so shaped and so moved up and down that, in raised position, they will engage safely with the sheet to be aligned, and, in lowered position, they will provide a flat support for the lying sheet.

On the accompanying drawings illustrating my invention,

Fig. 1 is a vertical section through the lower end of the feed-table, showing the position of the sheet controlling and aligning parts at the moment when an overlying top sheet is passing off the feed table to a printing or other machine, and the underlying second sheet is just entering under a cover plate, to be carried along at a reduced speed to the front gauges,

Fig. 2, a section corresponding to Fig. 1, showing the extreme front end of the feed-table at a moment when the front end of the underlying sheet has been carried along by the cover plate nearly to the front gauges,

Fig. 3, a section corresponding to Fig. 2, showing the underlying sheet in contact with the front gauges, the cover plates having passed beyond the front end of the feed-table previous to starting their return motion back to the position shown in Fig. 1,

Fig. 4, a plan of the guide rods for keeping down the sheets, showing the position of the feed-table, one of the front gauges and a cover plate,

Fig. 5, a section corresponding to Fig. 1 showing a front gauge and a gripper just before commencing the swinging motion for passing the sheet to some transport device, or to the machine,

Fig. 6, a section corresponding to Fig. 5 showing the front gauge and gripper after the sheet has been passed on,

Fig. 7, a plan of the lower end of the feed-table showing the relative position of the front gauges, intermediate guide-plates and grippers, and

Fig. 8, a side elevation of one of the intermediate guide-plates shown in Fig. 7.

Along the feed-table 1 the sheets are fed in such relation one to another that the following sheet 7 is overlapped by the previous sheet 8. On the shafts 2 (Fig. 5) there swings a sheet registering device carrying the front gauges 3, grippers 4 and gripper counter supports 5. The side gauge is provided on the feed-table 1 at some distance from the front gauges 3, as usual, but it is not shown in the drawings. By the sheet registering device the sheets are fed to a transport device of any suitable construction, such as reciprocating or rotary transfer grippers, the path of which is indicated in Figs. 1, 5, and 6 by the arc 6. Such grippers are usually mounted so that a cap will be provided to avoid any interference with the registering device during and immediately after the transfer of a sheet to said grippers.

Each sheet is fed first to the cover plates or preliminary front gauges 20 (Figs. 1–4) which carry the sheet along to the front gauges 3, from which it then passes to the transport device describing the arcuate path 6, on its way to the printing or other machine.

The preliminary front gauges 20 are operated by the mechanism shown in Fig. 1. In a guide way 11 there moves a slide 12 to and fro under the action of a connecting rod 13, bell-crank lever 14, roller 15 and cam 17 fastened on the shaft 16 which makes one revolution for each cycle of operations. On the slide 12 there is an arm 18 which, at its front end, carries a cover plate 20 pivoted on a pin 19. This plate 20 is opened and closed by a lever 21 moved by the connecting rod 22, bell-crank lever 23, roller 24 and

cam 25, when the lever 23 is moved to and fro. Both the guideway 11 and cam 25 are fixed to a shaft 27 which is oscillated by the lever 28, roller 29 and cam 30 fastened to the shaft 16. The roller 24 is pressed on the cam 25 by the spring 31, while the roller 29 is pressed on the cam 30 by the spring 32, and the roller 15 on the cam 17 by the spring 33.

This part of the device operates as follows:—

During each cycle of operations the cover plates 20 are moved to and fro in a slot 36 in the feed table (Fig. 4) together with the slide 12. In thus reciprocating, the plate 20 is opened by the cam 25 when approaching the back end of its stroke (Fig. 1) and is closed again shortly after its forward motion begins (Fig. 2). It remains closed during the remainder of its motion backwards and forwards. During the motion forwards the guideway 11 is kept parallel to the feed table 1 by the cam 30, so that the plates 20, as is clear from Fig. 2, will keep the sheet 7 flat on the feed-table, with but little play, during the forward motion. It is preferable to make the pin 19 vertically adjustable on the arm 18, to adapt it to the thickness of paper or cardboard; this is not shown on the drawings for the sake of greater simplicity. Further, the arm 18 must be adjustable according to the height of the feed table. When the sheet 7, which is moved forward, together with the plates 20, and, during this motion is kept in contact with the cover plates 20 by a suitable speed of the transport tapes, arrives in contact with the front gauges 3, it is prevented from moving further by these gauges. The plates 20 continue their forward motion until their back edges go beyond the front edge of the sheet 7, whereupon the roller 29 runs on a lower part of the cam 30, so that the guideway 11 takes a more downwardly inclined position, and the plates 20 sink below the surface of the feed table 1 (Fig. 3). Consequently the slide 12 can begin to move backwards while the sheet 7 is still in contact with the front gauges 3. As mentioned above, the plates 20 remain closed during the greater part of the backward stroke. Because, further, the guide 11 retains its inclined position the plates 20 remain at first underneath the feed table, and only take the position shown in Fig. 1 towards the end of the backward motion. In the meantime the aligned sheet 7, as will be described below, has been moved forward and has taken the position of the sheet 8. By the rising of the arm 18, and the opening of the plates 20, the back end of the overlapping sheet 8 is raised, while passing away, so that the next sheet 7 can enter the space between the plate 20 and feed table 1, even when its front edge is bent up as shown in Fig. 1.

The front gauges 3 as shown particularly in the Figs. 1 and 6 have three superposed motions: They swing to and fro about the axis 41 relative to the body 40 of the sheet registering device; the axis 41 swings up and down about the axis 42; and the body 40 of the sheet registering device oscillates about the axis 2.

To the axis 42 there are fastened arms 43 in which the axis 41 is journalled. To the axis 42 there is fastened an arm 44 (Fig. 5) which carries a roller 45 that runs on a cam 46 turning about the axis 2. The devices for moving the sheet registering device 40 about the axis 2 and for moving the cam 46 are not shown in the drawings, because they are of secondary importance. They must however be so arranged that the roller 45, under the common influence of the rolling motion resulting from the swinging of the sheet registering device about the axis 2, and the swinging of the cam 46, describes the up and down movements which are necessary as shown below. The roller 45 is pressed by a spring 48 attached to an arm 47 continuously on the cam 46, unless the screw 50 on the arm 49 which is also carried by the axis 42, limits the downward movement of this roller by pressing against the stop 51 fixed on the sheet registering device.

The carriers 55 of the front gauges 3 (Fig. 1), fixed on the axis 41, are swung to and fro relative to the sheet registering device by an arm 56 (Fig. 5) which is fastened to the axis 41 and is connected by a connecting rod 57 with a lever 58. On the axis 59 of the lever 58 there is fixed an arm 60 which carries a roller 61 running on the cam 62. A spring 63 connected to the lower end of the lever 58 presses the roller 61 continuously against the cam 62 and has the tendency to turn the carrier of the front gauges 55 in the direction of the hands of a clock. The front gauges can follow this pressure until a lever 64 (Fig. 6) on the axis 41 presses against a roller 65 which, as will be described below, is journalled in the paper registering device. By this means the extreme right position of the front gauge carrier 55 is sufficiently determined, even when the front gauges, owing to the swinging of the axis, are moved up or down.

The front gauges 3, which when seen from the side, have a distorted M-shape, can be so adjusted in screwing the angular piece 71 to the carrier 55 that they all have the same height relative to the feed-table. The fine adjustment vertically, in accordance with the thickness of the sheet material, is effected for all the front gauges and for the cover plates described below by adjusting the screw 59 which influences the height of the axis 41. On the angular body 71 the front gauges are finally adjustable horizontally by the adjusting screws 72 and can be fixed by the screws 73. This horizontal adjustment of the front gauges is effected for each gauge separately, unless the roller 65, as is possible, although mostly superfluous, is made adjustable, or an adjustment screw is provided on the arm 64.

In addition to the front gauges 3, there are provided, on the axis 41, cover plates 75 (Figs. 7 and 8) which describe the same movements as the front gauges and only differ from these by the fact that they have no vertical abutment surface for the sheet to be aligned, and consequently they do not need to be adjustable horizontally, for which reason they are fastened to the carriers 55 without using any intermediate piece.

In the sheet registering device 40 there is a shaft 81 which carries the grippers 4. These grippers, when closed (Fig. 5), press the aligned sheet against the counter-supports 5 which are screwed fast on a rod 83 provided in the sheet registering device and are supported again by the movable axis 42. On the similarly fastened body 84 there are provided the rollers 65 mentioned above (Fig. 6). The gripper counter-supports 5 have arcuate extensions to support the sheet when it is pulled away from the feed-table by the sheet registering device.

The operation of this part of the device is as follows:

Although the cover-plates 20 keep down the front edge of the sheet as long as it moves towards the front gauges 3 (Fig. 2), still this occurs only at the few points where such cover-plates 20 are provided. At intermediate points

the front edge of the sheet can bend up. For this reason the cam 46 (Fig. 5) is so shaped that the roller 45 and therefore also the cover-plates 86 of the front gauges 3 and the intermediate cover-plates 75 are raised when the front edge of the sheet 7 arrives at the back edge of these cover plates (Fig. 2). Consequently the front edge of the sheet passes with certainty under the cover plates. The cam 46 now causes the axis 41 and all the cover-plates to descend quickly, so that these plates closely cover the sheet edge, with an amount of play regulated by the screw 50, shortly before the sheet contacts with the vertical abutment surfaces of the gauges 3. One of the principal requirements of an exact register is thus met. The entire front edge of the sheet is flattened on the feed table, and the rise or bulging of the sheet is prevented with certainty, particularly at the front gauges. At the same time the speed of the cover-plates 20 is so chosen that the speed at which the sheet meets the gauges 3 is as low as possible. (In order to bring the cover plates out of the range of the sheets as quickly as possible, the motion of the slide 12 can be accelerated again).

The descending cover-plates work better than those used in devices in which the alignment does not take place in overlapped condition, and in which cover plates having a horn-shaped under-surface are stationary at the time when the sheet to be aligned enters the narrow space below them. However they only hold the sheet down in the neighbourhood of the front edge of the sheet and do not replace the guide-rods commonly used which lie on the sheet also at a greater distance from the front gauges and prevent bulging. For that reason guide-rods 87 are provided here as well which however do not act immediately on the sheet to be aligned, as is usually the case, but they press against the overlying sheet and thus act mediately on the underlying sheet. These guide-rods are not fastened in the machine, but they are lowered just at the moment when the cover plates 75, 86 descend (Figs. 1 to 5). In order not to bend the overlying sheet 8 in an irregular manner, the cover plates 20, 75, 86 have the shape of flat plates, which permit the guide-rods 87 to descend close to the feed table without creasing the overlapping sheet. In this position the guide-rods, in spite of the intermediate overlapping sheet 8, hold down the sheet 7 being aligned in exactly the same way as in a device in which the alignment is effected in a non-overlapping condition. Further, the guide-rods, in spite of the overlapping sheet, can be used to guide that part of the front edge of the sheet which is bent up between the plates 20, under the cover plates 75, 86, if, as shown in Fig. 2, their ends are brought to the height of said cover-plates, at least at the moment when the front edge of the sheet moves under the back edge of said plates. On the other hand, the guide rods 87, as long as they are not serving the purpose set forth above. must be turned up about the axis 88 (Fig. 1), as otherwise the overlying sheet would be clamped by the rising cover plates.

As long as the sheet 7 lies against the front gauges, the sheet 8 is pulled away continuously by the transport grippers and later by the machine itself. When its back edge has passed the side aligning gauges which are at some distance from the front gauges, these side gauges begin to operate. Before the side alignment is finished, the back end of the sheet 8 should have preferably left the front gauges entirely, so that, at least for a moment, it may be seen whether the sheet lies properly against the front gauges. For this purpose, the cover plates of the front gauges are provided with a T-shaped opening which exposes the vertical surface of the gauge for a short distance. Further, the time, when the sheet being aligned is exposed, can be utilized for the usual contact devices which stop the machine or separate the printing organs when a sheet is not properly aligned, unless such contact devices are so made that they can work in overlapped condition.

As soon as the side alignment is finished, the grippers 4 close (Fig. 5), and the sheet registering device 40 then begins to swing forward with accelerating speed. Because the aligned sheet, after being transferred from the sheet registering device to the transport device, is lifted off the gripper counter-support 5 of the sheet registering device, the cover-plates 75, 86, must be moved out of the way while the sheet registering device is passing from the aligning position to the point at which the sheet is taken over by the transport device. To this end their back edge, as in the case of the cover plates 20, are moved away in front of the aligned front edge of the sheet and under the path of said sheet; both operations are obtained simultaneously, in the arrangement adopted by a swinging forward of these cover plates about the axis 41, under the influence of the cam 62 (Figs. 5 and 6).

At this point, the sheet registering device swings back into the aligning position, the roller 61 running on the cam 62, so that the front gauges 3 take their original position, shown in Fig. 1, relative to the sheet registering device. In Figs. 5 and 6 there is a sheet 91, overlapped by the sheet 7, which, in the time between the two figures, as shown by the position of the parts, has approached the aligning position somewhat. This sheet 91 becomes sheet 7 in Fig. 1, while the previously aligned sheet 7 becomes the overlapping sheet 8.

To assure that no vacuum is formed when the sheet 8 is raised by the cover plates 20, which might raise the sheet 7 as well, it may be preferable to open the cover plates earlier than described and slowly. In this case the cover plates are preferably opened by a different part of the cam 25 from that serving to close same.

What I claim and desire to secure by Letters Patent of the United States is:

1. A device for feeding sheet material to a machine, comprising in combination, a feed table over which sheets move in overlapping relation to one another, front registering gauges adapted to align an underlying sheet at the front end of said feed table, cover plates on said front gauges, extending rearwardly and adapted to cover the front end of each sheet, guide-rods in a higher plane than said front gauges, adapted to keep down the overlapping sheet and thus to mediately control the underlying sheet in passing to said front gauges.

2. A device for feeding sheet material to a machine, comprising in combination, a feed-table over which sheets move in overlapping relation to one another, front gauges adapted to align each said sheet at the front end of said table, guide rods adapted to keep down the overlapping sheet and thus to mediately control the underlying sheet in passing to said front gauges, sheet controlling means adapted to engage the front edge of said underlying sheet to be aligned and

mechanism to lower said sheet controlling means to provide a not too bulging support for said overlapping sheet.

3. Sheet registering mechanism, having in combination, a registering table adapted to support a continuous bank of seriated sheets, front registering guides, sheet slow-down means arranged to close on the top surface of an underlying sheet and adapted to present the leading edge of the foremost sheet to said guides, and means extending above said table and said registering guides and adapted to hold down a registered sheet while it is being removed, to thereby prevent the leading edge of an oncoming underlying sheet from curling up while it advances to said slow-down means.

4. Sheet registering mechanism, having in combination, a sheet registering table adapted to support a continuous bank of seriated sheets, movable front registering guides having a portion thereof extending over the leading edge of a sheet to be registered, sheet slow-down means adapted to present the leading edge of an underlying sheet to said guides, and means extending above said table and said registering guides and adapted to hold down a registered sheet while it is being removed, to thereby prevent the leading edge of an oncoming underlying sheet from curling up while it advances to said slow-down means.

5. Sheet registering mechanism, having in combination, a sheet registering table adapted to support a continuous bank of seriated sheets, front registering guides and grippers bodily movable with the registered sheet and having a portion thereof extending over the leading edge of a sheet to be registered, sheet slow-down means adapted to present the leading edge of the foremost sheet to said guides, and means extending above said table and said registering guides and adapted to hold down a registered sheet while it is being removed, to thereby prevent the leading edge of an oncoming underlying sheet from curling up while it advances to said slow-down means.

6. Sheet registering mechanism, having in combination, a registering table adapted to support a continuous bank of seriated sheets, front registering guides, sheet slow-down means adapted to present the leading edge of an underlying sheet to said guides and having a portion thereof extending over the leading edge of an oncoming sheet to hold it down, and means extending above said table and said registering guides and adapted to hold down a registered sheet while it is being removed, to thereby prevent the leading edge of an oncoming underlying sheet from curling up while it advances to said slow-down means.

7. Sheet registering mechanism, having in combination, a registering table adapted to support a continuous bank of seriated sheets, front registering guides, preregistering means having a portion thereof extending over the leading edge of a sheet to be registered in order to avoid curling up of said leading sheet, said preregistering means being adapted to slow down sheets to be registered during their travel to said front registering guides and having means to raise a previously registered sheet above an oncoming sheet, and means extending above said table and said registering guides and adapted to hold down a registered sheet while it is being removed, to thereby prevent the leading edge of an oncoming underlying sheet from curling up while it advances to said slow-down means.

8. Sheet registering mechanism, having in combination, a registering table adapted to support a continuous bank of seriated sheets, front registering guides, preregistering means adapted to receive an underlying sheet and opening above a sheet so that it may close on the top surface of said sheet, slow it down, and move bodily with a sheet to present it to said front registering guides, and means extending above said table and said registering guides and adapted to hold down a registered sheet while it is being removed, to thereby prevent the leading edge of an oncoming underlying sheet from curling up while it advances to said slow-down means.

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