

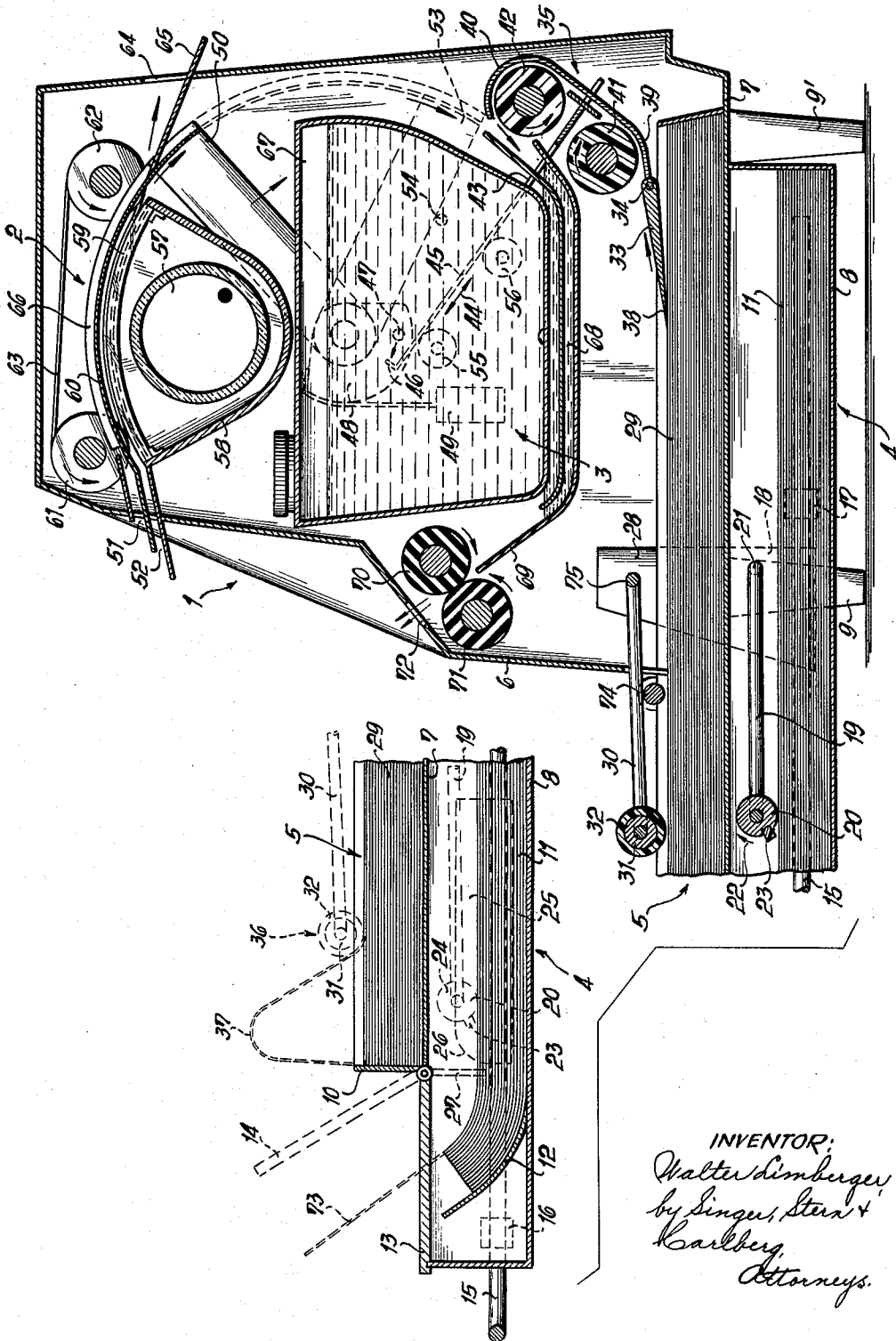
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APPARATUS FOR MAKING COPIES

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APPARATUS FOR MAKING COPIES

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This invention relates to an apparatus for making copies by using two sheets of copying paper, one of which is passed together with the original to be copied initially through an exposure device, and thereupon together with the other sheet of copying paper through a developing device.

In making copies according to the diffusion method the sheets of copying paper consist of the so-called negative and positive sheets of paper. If already the operation of an apparatus, into which during one operating step three sheets of paper (the original and two copying papers) have to be introduced, and which possibly requires other manipulations yet, is rather intricate, the operation is rendered more difficult yet by the fact that the negative paper is light sensitive. Therefore this sheet of paper must be removed quickly from a container and introduced into the apparatus, and at the same time it must be aligned at least with the original too.

This manipulation requires relatively great skill, and in spite of it spoilage cannot be avoided with certainty.

For storing particularly light sensitive paper it is known to use sheet dispensing containers out of which these sheets of paper may be transported by means of a hand lever and a mechanism arranged within the housing of the dispensing container. These dispensing containers are with respect to the exposure device separate means, and therefore always a certain transporting path is required to transfer the negative sheet of paper to the apparatus for making copies.

One object of the invention is to provide an apparatus for making copies in which the disadvantages of the known devices are avoided, which is simple to manufacture and which is easy to operate without any especial expenditure, and in particular without complicating the apparatus.

This problem is solved according to the invention in that for each one of the different sheets of paper a dispensing device is provided, both dispensing devices being coupled in such a way that the second sheet of copying paper is pushed to the entrance of the developing device by the extraction of the first sheet of copying paper.

By means of this arrangement only one actuation is required for operating two sheet dispensing devices and, even though two sheets of copy paper are being fed, the associated apparatus for making copies may be actuated like an apparatus using only one sheet of copy paper which, if desired, may additionally be readily achieved in a very advantageous manner with the same apparatus.

According to a preferred embodiment the hand lever for dispensing the first sheet of copy paper is also connected with a corresponding feed roller arrangement by means of which the second sheet of copy paper is pushed in a position of readiness. Suitably the connection between the hand lever and the feed roller arrangement for the second sheet of copy paper provides for a reverse movement with respect to the direction of dispense of the first sheet of copy paper, so that both sheets of copy paper are dispensed in opposite directions.

The reversal of movement may for example be achieved in such a manner that the hand lever having the form of a

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draw bar is actuating a double armed lever the ends of which each control a feed roller arrangement.

According to an especially advantageous embodiment a non-rotatable feed element is disposed within the dispensing device for the second sheets of copy paper, said feed element being moved in the same direction as the feed roller arrangement within the dispensing device for the first sheets of copy paper. This feed element cooperates on the one hand with an abutment edge, e.g. a face wall of the housing of the dispensing device, and on the other hand with a rake pivotally engaging the top of a pile of paper sheets in such a way that always, in initially moving the feed element in a first direction, the top sheet of paper is bent upwardly by abutting said edge and simultaneously is drawn forwardly from beneath the rake, said top sheet being pushed over the rake into a position of readiness when the feed element is moved in a second opposite direction. This second movement is assisted by the fact that the resiliency of the bent-up portion of the sheet abutting the edge will act in a direction of the second movement.

This second movement corresponding to a return movement of the hand lever may be left to the operator having to move the hand lever for one actuation in both directions. Preferably however the hand lever is connected with a spring moving the hand lever back automatically.

In the position of readiness in front of the developing device transport means must be provided which will take care of further transporting the paper, but which must also provide for a stopped position of the sheet of paper in its position of readiness. This transporting means may be formed by pairs of rollers which will engage the sheet of copying paper, and which is driven in exact timing, or the transporting means may preferably be formed by a curved transporting path and at least one transporting roller which will be engaged by the sheet of paper, due to its inherent resiliency when it is bent in passing the curved transporting path.

A preferred embodiment according to the invention provides for an arrangement of the sheet dispensing devices in a superimposed position below an apparatus for making copies. In this it is preferred to provide a staggered arrangement in which the upwardly facing exposed portion of the lower forwardly projecting sheet dispenser is forming a lid for dispensing the sheet of paper which has to be fed into the apparatus together with the original to be copied.

Additional advantages and features of the invention will become evident from the following description of one embodiment, shown by way of example only in the attached drawing.

The drawing shows a sectional side view of an apparatus in accordance with the invention.

Below an apparatus denominated in its entirety with the reference numeral 1, comprising within a housing an exposure device 2 and a diffusion developing device 3, there are provided two functionally combined sheet dispensing devices 4, 5. The sheet dispensing device 5 which, if a diffusion developing device 3 is used, contains the positive sheets of paper, partly extends into the housing 6 of the apparatus 1, i.e. it is disposed at least with its rearward end position above the bottom plate 7 of the apparatus. The sheet dispensing device 4 serves in the illustrated embodiment to receive a stack of negative sheets of paper. The housing 8 of the sheet dispensing device 4 is arranged at least partly below the housing plate 7 and between the legs 9, 9' of the apparatus.

Both sheet dispensing devices project beyond the apparatus 1 at its operating side. The bottom plate 7 needs not extend over the same length. As may be seen in the drawing a staggered arrangement is preferred, being such

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that the housing 8 of the sheet dispensing device 4 is projecting forwardly beyond the container 10 of the sheet dispensing device 5, the exposed part of which may have an open top. By means of this a step-like arrangement is formed. It should be noticed however that according to the invention the sheet dispensing device 5 may also be provided with a top cover.

The sheet dispensing device 4 supports the stack 11 of negative sheets of paper on its bottom. The forward end is provided with a curved upwardly extending guide surface 12 which in dispensing will guide the forward ends of the sheets to the surface 13 of the housing 8 said surface 13 being exposed upwardly by the staggered arrangement of the sheet dispensing devices. The surface 13 is formed by a lid which is shown at 14 in its open position. Thus the lid 13 covers the dispensing opening of the housing 8 of the sheet dispensing device 4 in a light proof manner and is only opened when a sheet of paper is passed out.

A hand lever in form of a draw bar 15 is serving to actuate the sheet dispensing device 4, said hand lever being guided longitudinally on one or both side walls of the housing 8 for example, in bearing bushings 16, 17. A bridge 18 arranged within the housing and extending across the stack of sheets is fixed to one or both arms of the draw bar 15. Pivotally attached to this bridge 18 is a pivoting lever 19 which is carrying a feed roller 20 at its free end facing the dispensing opening. This feed roller 20 engages with the weight of this arrangement, formed by the feed roller 20 and the pivoting lever 19, on the top sheet. It should be noted however that, according to a preferred embodiment, the pivot point is selected at a location that the draw bar 19 is declining somewhat towards the end carrying the roller.

The roller is rotatable only in the direction indicated by the arrow 22 and is blocked against rotation in the opposite direction. Therefore, if the draw bar 15 is pulled forwardly the roller cannot rotate but takes the top sheet of paper along, due to the frictional force caused by the pressure of the weight. If the draw bar 15 is returned, either by action of the operator, or by the force of spring, the roller may rotate, i.e. it may return over the pile of sheets substantially without friction, so that no feeding action is exerted on the top sheet.

It may be seen from the drawing that within the circumferential surface of the roller 20 an axially extending strip 23 is provided consisting of a material having good frictional characteristics. This strip 23 extends radially beyond the circumference of the roller 20. The adjustment of the roller 20 is such that the strip 23 will be directed obliquely downwardly in the starting position of the advance movement, thus acting directly upon the uppermost sheet of paper when the draw bar is actuated. In an arrangement with such a strip 23 the circumference of the roller is dimensioned with respect to the path of movement of the draw bar 15 in such a manner that the return movement from the position 24 shown in dashed lines to the starting position shown in full lines will cause an angular movement of the roller 20 about 360° so that the strip 23 will return to its initial position.

Furthermore a cam slide 25 having a rounded cam surface 26 at its forward end is mounted on at least one arm of the draw bar 15. This cam surface 26 cooperates with an actuating lever 27 for the lid 13, 14. When the cam surface 26 engages the actuating lever 27 which extends into the housing 8 the lid 13 will be raised into its position 14 shown in dashed lines. Upon returning the draw bar 15 and therewith the cam slide 25 the lid will fall, preferably by gravity, into the closed position. The cam surface 26 of the cam slide 25 is adjusted in such a way that the lid will open automatically when the top sheet of paper 73 is moved through the dispensing opening.

Legs 28 are extending from the bridge 18 through the bottom plate 7 of the housing 6 into the sheet dispensing

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device 5 above the stack 29 of the sheets of positive paper. The legs 28 are disposed laterally of the stacks 11, 29 and are extending through slots provided in the bottom plate 7. A pivoting lever 30 corresponding to the pivoting lever 19 is mounted rotatably on the legs 28, a feed element 31 being arranged at the free end of the pivoting lever 30. This feed element 31 is shown in the drawing to be cylindrical, but is arranged non-rotatably on the pivoting lever 30. The entire circumference of the feed element 31 is provided with a covering 32 having good frictional characteristics.

Below the pivoting lever 30, which preferably is formed by a U-shaped stirrup, the leg or legs of which are disposed above the side walls of the box for the stack of paper sheets 29, supporting means, preferably formed by a roll 74, are arranged in such a way, that the feed element 31 is lifted off, or the engaging pressure respectively is relieved from the stack 29 when the feed element is in its inward position, as shown in full lines. This is achieved in connection with the supporting means 74 by a declined arrangement of the pivoting lever 30, or the pivoting lever arm respectively, toward the feed element 31, the pivot point 75 being arranged in such a height that the arm of the stirrup-like pivoting lever 30 moves in its retracted position on top of the supporting means 74 thereby lifting the feed element, while upon forward movement it will move away from the supporting means 74. The same effect would be attained if for example a wedge-like engaging surface would be arranged on the lower side of the pivoting lever 30 in such a manner that the wedge-like surface would be moved in engaging contact on the supporting means 74.

The face wall of the housing 10 is defining the forward end of the stack 29. This face wall extends over the height of the stack. A pivotally arranged rake 33 is resting on the rear end of the stack 29. This pivotal rake is hingedly connected at 34 with a guide path 35 for a positive sheet of paper. It should be noted that it is important to have the stack 29 extend at least below the pivotal rake 33.

When the draw bar 15 is actuated the feed element 31 is moved to the position 36 shown in dashed lines. By means of this, initially the feed element is brought into engagement with the top sheet of paper which thereby will be taken along if the movement is continued and, as shown at 37, will thereby be bent upwardly caused by abutting against the face wall of the housing 10. The length of the path of movement, or the dimensioning of the parts respectively, is such that the rear edge of the top sheet of paper, which is bent upwardly at its front edge, as shown at 37, is pulled forwardly free from below the rake 33. Upon return movement of the draw bar 15, and therewith of the feed element 31, the top sheet of paper is taken along, this movement being assisted by the stress inherent in the bent portion 37. In its retracted position the feed element is lifted, as already described. As the rake 33 is resting already with its sharp edged end 38 on the next sheet of the stack after the top sheet has been advanced, the rear edge of the top sheet will move upon the return movement of the feed element 31 onto the upper side of the rake 33 so that this sheet of paper is moved into a position of readiness in front of the developing device 3 on the guide path 35. Due to the fact that the feed element 31 is lifted free from the stack in its starting position, the little frictional forces of the elements acting on the sheet of paper will suffice to advance the sheet of paper.

The arrangement for moving the sheet into its position of readiness comprises the guide path 35 with the curved portions 39, 40. Within these portions transporting rollers 41, 42 are arranged with spaced relation to the guide path for rotating movement in the direction indicated by the arrows. The arrangement is such that the top sheet of paper is moved through the curved portion 39 already, when it is taken along by the feed element

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31 on its return movement. Due to its resiliency the sheet of paper will contact the roller 41, thereby being advanced to the guide path 35. The sheet of paper will move through the curved portion 40, until it engages an abutment 43 provided in the feed path to the bath of the developing device. The strongly curved portion 40 ensures a relatively great component of advance to be exerted on the sheet of paper, but at the same time allowing, due to the space between the guide path 35 and the transporting rollers 41, 42, free rotation of the rollers relative the sheet of paper, which is stopped on the abutment 43. When the abutment 43 is released, as shall be described followingly, the component of advance becomes effective and the sheet of positive paper is moved into the developing device with a rate determined by the speed of the roller 42.

The abutment 43 comprises an actuating rod 45 guided on rolls 55, 56 for reciprocating movement, as indicated by the arrow 44, said actuating rod 45 being provided with an abutment 46 at one end. This abutment, for example, cooperates with a pin 47 mounted on a pivotal segment 48 which is arranged within the housing 6. The pivotal segment is moved into the illustrated position by a weight 49 which is suspended on the pivotal segment 48. A rotating lever 50 is connected with the pivotal segment 48, said rotating lever controlling the movement of the original to be copied and the negative sheet of paper, which are introduced into the apparatus through the housing slots 51, 52, as they are passing the exposure device. The rotating lever 50 is angularly moved in dependence of the advance, particularly of the original to be copied, into the position 53 where it engages an abutment 54, said pivotal segment 48 being taken along, and thereby the abutment 43 will be opened.

For the sake of completeness it is pointed out that a source of light 57 is arranged within a housing 58 having a transparent exposure plate 59, and serving at the same time as a reflector. Mounted on the rotating lever 50 is a tongue 60 extending over the exposure plate 59 and reaching to the introduction slots. An arrangement of rollers 61, 62 and belt 63 is provided serving as a drive. The original to be copied is received above a stripper 65 and removed through the slot 64 out of the housing 6. The tongue 60, for example, is provided with a rib-like abutment 66 which will be engaged by the original to be copied as it is driven by the belt 63, whereby the tongue 60 and the rotating lever 50 are moved to the position 53. The stripper 65 is formed in such a way that it will side-wardly extend beyond the abutment 66. The exposure device 2 comprises a supply container 67 for the developing liquid, and a bath container 68 provided with two passage ways. From the bath container 68 the positive and the negative sheets of paper are moved via the guide surface 69 and a pair of squeezing and transporting rollers 70, 71 toward the exit slot 72 through which they are moved out of the apparatus.

What I claim is:

1. An apparatus for making copies by using a first and a second sheet of copying paper, said first sheet of copying paper being initially passed through first processing means and then together with the other sheet of copying paper through second processing means, said apparatus comprising a housing, first processing means arranged within said housing, first inlet means within said housing through which said first copying paper together with an original to be copied are fed to the inlet of said first processing means, first outlet means arranged on said housing through which said original after having passed said first processing means is moved out of said housing, a second processing means arranged within said housing, first guide means extending from said first processing means to said second processing means for passing said first copy paper from said first processing means to said inlet means of said second processing means, second outlet means arranged within said housing for moving said

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first and said second copy papers out of said housing, a first sheet dispensing means arranged on said housing adapted to receive a stack of said second sheets of copy paper, second guide means extending between said first sheet dispensing means and said inlet to said second processing means for guiding one of said second sheets of copy paper dispensed by said first sheet dispensing means to said inlet of said second processing means, second sheet dispensing means arranged on said housing adapted to receive a stack of said first sheets of copy paper, first feed means for removing one of said first sheets of copy paper out of said second sheet dispensing means, second feed means arranged within said first sheet dispensing means for feeding one of said second sheets of copy paper to said second guide means, said first and said second feed means being drivingly interconnected so that upon removal of one of said first sheets of copy paper out of said second sheet dispensing means one of said second sheets of copy paper will be removed out of said first sheet dispensing means and fed to said second guide means, common actuating means for said first and second feed means extending out of said housing, and guide means in one of said sheet dispensing means for guiding said actuating means for reciprocating movement.

2. An apparatus according to claim 1, in which spring means are provided connected with one end with said hand lever and with the other end with said housing, said spring means becoming stressed when said hand lever is moved in one direction.

3. An apparatus according to claim 1, in which said hand lever is supported for reciprocating movement on said second sheet dispensing means for said first copy paper, a pivoting lever is rotatably mounted on said hand lever, and a roller is mounted on the free end of said pivoting lever, said roller being rotatable in one direction only and resting on the stack of said first sheets of copy paper.

4. An apparatus according to claim 3, in which an insert strip of friction increasing material is mounted on the circumference of said feed roller extending axially therealong, the circumference of said feed roller being dimensioned with respect to its working stroke so as to rotate through an angle of approximately 360° when said feed roller is returned to its initial position.

5. An apparatus according to claim 1, in which actuating means are extending out of said housing, and connecting means are drivingly connected with said feed means for simultaneously actuating said first and said second feed means, said actuating means comprising a hand lever guided in one of said sheet dispensing means and coupled with connecting means interconnecting said first and said second feed means, said connecting means being arranged for reciprocating movement within said first and said second sheet dispensing means, said second sheet dispensing means being arranged within a housing, the sheet dispensing end of which having closure means arranged thereon adapted to be opened, coupling means the cooperating parts of which being mounted on the one hand on said housing closure means and on the other hand on said hand lever in such a way that said closure means will be opened when one of said first sheets of copy paper is removed from said second sheet dispensing means.

6. An apparatus according to claim 5, in which said coupling means comprise a slide and a pivoting lever, said slide being mounted on said hand lever and being provided with a cam surface, said pivoting lever being mounted on said movable closure means, said cam surface on said slide and said pivoting lever engaging each other upon movement of said hand lever causing said closure means to be moved.

7. An apparatus according to claim 1, in which actuating means are provided extending out of said housing and connecting means being drivingly connected with said feed means for simultaneously actuating said first and said second feed means, said first feed means comprising;

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a non-rotatable feed element, a pivoting lever, ramp means for said pivoting lever, the arrangement being such that said pivoting lever is rotatably mounted on said connecting means, said feed element is arranged on the free end of said pivoting lever, and said ramp means for said pivoting lever are arranged in such a way that said feed element will be lifted free from said stack of second sheets of copy paper in its position of rest, but upon movement of said feed means will be lowered into contacting engagement with the top sheet of said stack of second sheets of copy paper, rake means hingedly connected with said second guide means the free end of said rake means resting on the top sheet of said stack of second copy papers in a zone adjacent its one end, and an abutment edge provided at the opposite end of said sheet dispensing means against which the facing edge of a second sheet of copy paper will abut when said first feed means are actuated for pulling the opposite edge of said second sheet of copy paper out from below said rake means, said second sheet of copy paper will bend upwardly in the zone between said abutment edge and said first feed means when the latter are actuated.

8. An apparatus according to claim 1, in which the second feed means comprise; a curved guide surface, at least one driven transporting roller spacedly arranged from said guide surface, but journaled in the zone of curvature causing said second sheet of copy paper to bend when moving into said second guide means and to contact at least one transporting roller due to its inherent re-

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siliency, thereby being moved against abutment means arranged within said second guide means, said abutment means being movably supported in such a way that upon actuation said abutment means may be retracted out of said second guide means, thereby allowing said second sheet of copy paper retained in said second guide means by said abutment means to pass said second guide means and to be fed to the inlet of said second processing means.

9. An apparatus according to claim 8, in which coupling means are arranged between said first guide means and said abutment means in such a way, that said abutment means will be retracted out of said second guide means when said first sheet of copy paper moves into said inlet of said second processing means.

10. The apparatus as set forth in claim 1, in which said first and second feed means are movable back and forth along the top of said first and second stacks, respectively, said first feed means feeding the top sheet from said first stack when said first and second feed means are moving in one direction, and said second feed means feeding the top sheet from said second stack when said first and second feed means are moving in the other direction.

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