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DEVICE FOR STORING AND DISPENSING SHEETS OF COPYING PAPER

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Fig. 2

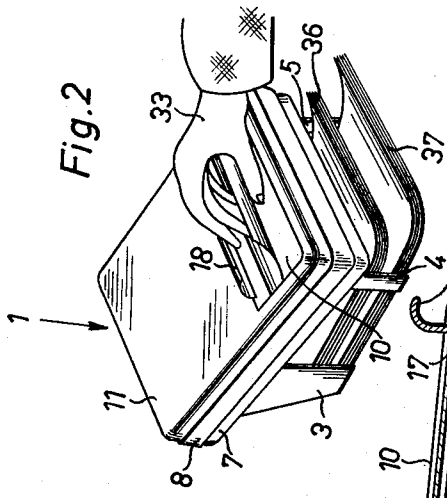
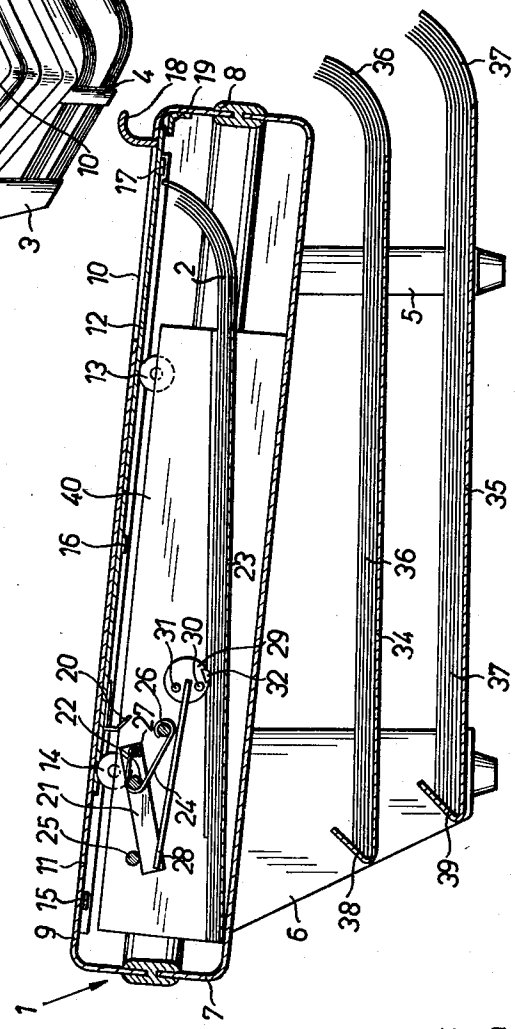


Fig. 1



INVENTOR
Walter Limberger
by Singer, Stern & Carlberg
Attorneys

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DEVICE FOR STORING AND DISPENSING SHEETS OF COPYING PAPER

Walter Limberger, Hamburg, Germany, assignor to Lumoprint Zindler K.G., Hamburg, Germany

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The invention relates to a device for storing and dispensing copying paper comprising a light proof chamber for the light sensitive paper, a cover closing the chamber, and a feeding element adapted for reciprocating motion above the top sheet of paper, the cover and the feeding element cooperating in such a manner that upon moving the cover the top sheet will automatically be pushed out through the opening of the chamber closeable by the cover.

In a known device of this type the feeding device comprises an element frictionally engaging the surface of the sheet. This engaging element is resting on the sheet by means of gravity. The cover of this known device is formed by a tiltable lid closing one of the face sides opening particularly the lower zone of the face side allowing the sheets being flatly placed on the bottom of the chamber to be pulled out.

When closing the tiltable lid the engaging element is pushed back upon the next top sheet forming a corresponding frictional engagement. During this operation it cannot be avoided that the top sheet is pushed against the rear wall of the chamber and thus folds may be formed. In any case the surface of the sheet is strongly stressed.

Furthermore, it should be considered that the engaging element is arranged on a feeder hingedly connected with the lid by rods the end of the feeder being situated in a higher plane than the engaging means. Therefore, when closing the lid a force will act upon the engaging means one component of which being directed in the direction of motion, i.e. horizontally on the top sheet towards the rear side of the chamber, while the other component is acting vertically upon the top sheet in correspondence with the inclination of the connecting rods, thus increasing the pressure of the highly frictional engagement of the engaging element on the top sheet. This will further the formation of folds and, besides this, if the paper has a certain stiffness, difficulties will arise when closing the lid which then will be held open by the feed mechanism if it is not pushed back into its closing position by exerting a considerable force. Besides, in such devices in which the feed of the sheet commences simultaneously with the actuation of the lid, it is furthermore necessary to provide sufficient free space between the closing end of the chamber and the stack of sheets in order to prevent that the advancing sheet strikes the not completely opened lid. Therefore, the chambers of the known devices are, with respect to the dimensions of the sheet, unnecessarily large.

For this reason, there are also known devices for storing and dispensing sheets of copying paper having two separate operating levers one for actuating the lid and the other one for operating the feeding device. This makes it rather cumbersome to grip a sheet fed out of the light-proof chamber. If the fact is considered that in servicing a copying device additional sheets, i.e. an original and a positive sheet of paper, must be fed into the device simultaneously it is evident that the known devices are extremely cumbersome and require a relatively long servicing time. Furtherfore the disadvantage arises that the light sensitive negative paper and the other paper sheets cannot be taken out of the device simultaneously, necessitating additional time during which the sheets must

be laid together or during which after a negative sheet has been taken out initially the other sheets must be pulled out of the device whereupon the sheets may be laid together. In this the light sensitive negative sheet of paper is exposed to light for a rather long period of time so that disadvantages with respect to the operation of the copying device will also occur. In addition, the particular actuation of the lid includes the possibility that the lid might accidentally not be closed. This would spoil the stack of negative paper sheets within the chamber.

In a device having two separate operating means it is also known to provide the feeding device with a roll reciprocating on the top sheet. Rolls of this type have a running surface with a high coefficient of friction and are supported by a one way clutch. This clutch prevents rotation of the roll on its advance motion so that the top sheet will be taken along by friction. When returning the roll to its initial position it may rotate, but jamming may also occur, or at least period for switching of the clutch over to the reverse direction must be considered during which considerable friction may be exerted on the top sheet. Due to this, the surface of the sheet, particularly the layer of the negative paper sheet, may be damaged or the sheet may be pushed against the rear wall of the chamber.

The disadvantages of the known devices are avoided by the invention in that a delay of time is provided between the opening of the cover and the advance of a sheet, said delay of time being achieved by a motion necessary to move the feeding element into frictional engagement with the top sheet.

According to a particularly advantageous form of embodiment the feeding roll has surface zones provided with materials of different coefficients of friction, and is guided in such a way that the material having the higher coefficient of friction becomes effective on advance movement while the material having the lower coefficient of friction becomes effective on return movement. According to an advantageous construction the rotatability of the roll is limited by means of stops and a guide rod, while the surface area engaging the top sheet on advance movement is wholly or partly provided with a material having a high coefficient of friction, for example a layer of rubber.

By means of this construction of the roll the use of a clutch is avoided, so that the roll due to its limited rotation may immediately adapt itself to the changing direction of motion, the frictional engagement thus being made or interrupted. Thus, according to the invention, the frictional engagement with the sheet is achieved in dependence upon the rotation of the roll which, within certain limits, may take place unrestrainedly. By means of this it is possible to construct a relatively small chamber in which the forward edges of the sheets coincide directly with the outlet opening.

According to a preferred embodiment a sliding cover is provided guided on the top wall of the chamber, this wall being slantingly arranged so that the sliding cover will automatically return to its closed position. Suitably the supporting surface of the sheets is arranged in a parallel distance to the supporting surface of the device having an end portion bent upwardly towards the opening arranged in the top wall of the chamber.

Preferably two additional not light-proof shelves for sheets are arranged below the light-proof chamber, suitably in an offset manner in such a way that the outlet end of the lower shelf is extending forwardly with respect to the upper shelf.

According to the invention initially a one hand operation is possible treating the negative with care, in which

the arrangement is made in such a way that the cover may be actuated with the backside of the fingers, the opened hand being directly in front of the opening of the chamber. As the advance of the sheet is effected by the opening movement of the cover the top sheet will automatically move into the opened hand when operating the cover. Due to the automatic closure of the opening this hand may only be used for further handling the negative sheet of paper. At the same time the other hand of the operator may take the original and a positive sheet of paper from the shelves below the chamber, these sheets having their layer side arranged so as they must be placed upon each other. The sheets simultaneously drawn out of the device are automatically placed upon each other and may in the immediately attained correct layer arrangement directly be fed into the copying device. While up to now a skilled person needed about 8–10 seconds for drawing out the sheets and feeding them into the copying device, and in this failures in placing the sheets together were not at all eliminated, the same operation may, according to the invention, be done within a time of 3 seconds. Thus reduction of operating time amounts to about 200% with respect to the operating time achieved by the invention.

Further advantages and features of the invention will become evident from the following description of an example of embodiment shown in the accompanying drawing.

In the drawing:

FIG. 1 is a sectional side view of a device in accordance with the invention,

FIG. 2 is a perspective view of the device according to FIG. 1 showing a light sensitive sheet of paper just being taken out.

The device shown in FIG. 1 comprises a light-proof chamber **1** at its upper part, within which a stack of light sensitive negative sheets of paper **2** is arranged. The chamber **1** is supported on four feet **3**, **4**, **5**, and **6** in such a way that it slants with respect to the supporting surface of the feet **3–6**.

The chamber **1** consists of two parts, a lower part **7**, and an upper part **9** connected together by a framelike member **8**. The two part construction of the chamber is of advantage, as the deposition of the stack **2** into the chamber is facilitated.

The upper part **9** is provided with an outlet opening **10** in the top wall **11** at the lower end of the slantingly arranged chamber **1**. A sliding cover **12** guided on rolls **13**, **14** and serving to close the opening **10** is arranged on the lower side of the top wall **11**. In addition abutments **15**, **16**, **17** for lateral guidance may be arranged on the sides of the sliding cover **12**. These abutments, however, are so dimensioned that no frictional engagement will occur at the lower side of the sliding cover **12** so that the cover will move relatively easily on the rolls **13**, **14** and, due to the slanted arrangement of the chamber **1**, will automatically return to its closed position.

The closed and opened position of the sliding cover **12** is limited by the operating handle **18** arranged on the upper side of the sliding cover **12** projecting from the opening **10**. The operating handle serves as a stop and cooperates with the edges of the opening **10**.

As protection means for the light-proof closure additional screws **19** may be arranged at the edges of the opening **10** within the chamber, securely excluding any light to fall into the chamber.

In addition the sliding cover **12** is provided with a stop **20** which will engage with an operating mechanism of the feeding device.

The operating mechanism comprises a double armed lever **21** pivotally supported on pin **22**. The pin **22** is arranged on the side walls of an insert **40** which also forms the supporting surface **23** for the stack of paper **2**. The lever **21** is pressed into the illustrated position towards the stop **25** by a spring **24**, the stop **25** being likewise arranged on the side walls of the insert **40**. The spring **24** is, for example, wound around the pin **22**, and supported with one end on a stop **26** fastened to the insert **40**, while the other end engages a stop **27** fixed to the lever **21**. The longer arm of the lever is provided with a rod **28** serving as a support for the roll **29**. The roll **29** is provided with two noses **30**, **31** on at least one of its face sides, which may engage the rod **28** extending laterally of the face sides of the roll towards the center of the roll, thus allowing a limited rotation of the roll only. In the drawing the roll **29** is shown in an intermediate position of its rotating range.

The roll **29** for example is made of polished steel. A surface zone, preferably an axially directed strip of the surface is provided with a material layer **32** having a higher coefficient of friction than the material of the remaining part of the roll circumference. The material having the higher coefficient of friction may for instance be rubber, the surface of which may suitably be roughened somewhat. According to a preferred embodiment two or more bores may be arranged along the strip into which round rubber pieces may be inserted, the open ends of which may radially extend beyond the circumference of the roll.

The roll **29** rests by means of gravity on the top sheet of the stack **2**, for example in the shown position. If the cover **12** is opened by actuating the handle **18** the stop **20** engages the shorter arm of the lever **21** extending upwardly, thus rotating the lever **21** in a counterclockwise direction against the action of the spring **24**.

Due to this, the rod **28**, as seen in FIG. 1, is moved towards the right, i.e. towards the opening side of the chamber **1**, causing the roll, due to the friction between the roll and the top sheet, to rotate until the nose **30** engages the rod **28**. In this position the strip **32** having the higher coefficient of friction contacts the top sheet. Upon further advance of the rod **28** and consequently of roll **29** the latter cannot rotate anymore, whereby the top sheet caused by the friction between the sheet and the strip **32** of the roll **29** is moved out of the outlet opening being opened due to the actuation of the cover **12**.

Evidently, there must be a certain delay of time between the beginning of the actuation of the cover **12** and the advance of the top sheet, because the forward edges of the sheets are situated immediately below the cover, and the sheets may only be pushed out upon the return movement of the cover. This delay of time is achieved on the one hand by selecting a suitable distance between the stop **20** and the lever **21**, and on the other hand by the initial rotation of the roll **29** due to which the strip **32** is brought into the contact with the surface of the sheet. In this, care should be taken that the distance between the stop **20** and the lever **21** should not be great as the motion of the cover must be used for pivoting the lever. The use of the differing roll construction having a certain idle rotation in combination with the use of a sliding cover, therefore, represents an important feature because by means of this the required delay may be obtained automatically without any additional parts. It will readily be understood that the delay may suitably be adjusted by varying the position of the noses **30**, **31**, or by selecting different diameters for the roll.

After the sheet is advanced it is pulled out of the opening **10** in a manner to be described yet, at the same time releasing the slide cover which, by means of its own weight, will return into the closed position. Due to the return motion of the stop **20** connected with the cover, the spring **24** will urge the lever **21** back against the stop **25**, thereby also pulling the roll **29** back to its initial position. It will be evident that the roll, by means of friction, initially rolls along the top sheet until the nose **31** engages the rod **28**. The partial rotation is sufficient

to let the material strip 32 come free from the sheet so that the ground and very smooth surface of the roll having an extremely small coefficient of friction is contacting the top sheet. Therefore, the return motion of the roll to its initial position is practically not being influenced. It should further be noted that the rotation of the roll is at least partly effected by pulling the advanced sheet out from below the friction strip 32.

The arrangement of the opening in connection with the handle 13 makes it possible, as shown in FIG. 2, to move the cover 12 with the backside of the fingers of an opened hand 33 which, when the cover is opened, has a position in front of the opening 10 so that the sheet will be pushed into the hand which merely needs to be closed to pull the sheet out of the opening. Therefore, no additional actuation is required.

Furthermore, the figures show that according to the advantageous embodiment two additional shelves 34 and 35 are arranged below the chamber 1. The front ends 36 and 37 of these shelves are also bent upwardly according to the support surface 23. In addition, the shelves 34, 35 are staggered with respect to the chamber 1 in such a way, that the forward end of the lower shelf projects forwardly beyond the upper shelf. An arrangement like this may simply be obtained by slanting the rear edge of the feet 3 and 6 in the manner shown, and having the rear ends of the shelves 34 and 35 coincide with these slanted edges. By means of this it is readily possible to partly encase also the lower shelf which may be suitable to prevent soiling.

On the shelf 34 a stack of originals 36 is placed the letters facing upwardly. A stack 37 of positive sheets of paper which are not light sensitive are stacked on the shelf 35 the layer side of which facing also upwardly. In order to facilitate the removal of the top sheet the shelves 34 and 35 are provided with rear abutment walls 38, 39, slanting upwardly and forwardly, by means of this the top sheet will automatically extend forwardly beyond the lower sheet.

It is to be noted that the negative sheet of paper of the stack 2 is facing downwardly with its layer side. Now, if the negative paper sheet is drawn out with the right hand 33, as shown in FIG. 2, the left hand may simultaneously remove an original and a positive sheet of paper, all sheets being placed upon each other while being pulled out of the device. By means of this all the sheets are relative their layers in the correct position to be fed into the copying device, i.e. the negative sheet of paper on top with its layer facing downwardly, below the original with its letters facing upwardly, and below this the positive sheet of paper with the layer facing upwardly.

What I claim is:

1. In a device for storing and dispensing sheets of light sensitive paper, means defining a lightproof storage chamber having an inclined top wall with a transversely extending dispensing slot adjacent the lower end of said top wall, means within said chamber for supporting a stack of said sheets and provided with an edge portion that extends upwardly toward said dispensing slot, means defining a cover disposed below said top wall in close proximity thereto, roller means rotatably mounted within said chamber to support said cover means for sliding movement thereof in parallel relation with said top wall to open and close said dispensing slot, the inclination of said top wall being such as to cause said cover means to occupy its closing position by gravity, sheet feeding means within said chamber mounted for movement on the top sheet of said stack in the directions toward and away from said dispensing slot, stop means fixedly mounted in said chamber in position to be engaged by said feeding means to limit the movement thereof in the direction away from said dispensing slot, resilient biasing means connected with said feeding means for urging the same toward engagement with said stop means, abutment means on said cover means for engagement with said feeding means in the opening movement of said cover means to move said feeding means against the action of said biasing means, means forming part of said feeding means adapted to present a substantially friction-free engagement surface to the top sheet of said stack during the movement of said feeding means away from said dispensing slot and to present a frictional engagement surface to said top sheet during the movement of said feeding means toward said dispensing slot to thereby move said top sheet out from said chamber through said dispensing slot, and means projecting upwardly from the lower edge of said cover means in such a position as to enable an operator to open said cover means and grasp said emerging sheet by pushing against said upwardly projecting means with the back side of his fingers and at the same time clamp said sheet between said fingers and the thumb of the same hand.

2. The device as set forth in claim 1, wherein said means forming part of said feeding means comprises a roller having a substantially frictionless peripheral surface, means having a high coefficient of friction secured to said roller along an axially extending section of said peripheral surface, link means supporting said roller for rotary motion about an axis transverse to the direction of movement of said cover means, and circumferentially spaced stop means on said roller in positions for alternating engagement with said link means to thereby stop rotary motion of said roller, the spacing of said stop means and the interrelation of said stop means and said frictional section of the roller being such that movement of the roller in the direction toward said dispensing slot causes engagement of one of said stop means with said link means and thereby stops rotary movement of said roller in a position where said frictional section is in engagement with the top sheet of said stack while movement of said roller in the opposite direction first permits a degree of rotary motion of said roller and then stops such rotary motion with said substantially frictionless surface of the roller in engagement with the top sheet of the stack by engagement of said link means with the other stop means on the roller, whereby opening of said cover means first causes said roller to roll on said top sheet until stopped with said frictional section in engagement with said top sheet whereupon continued opening movement of the cover means causes dispensation of the top sheet through said dispensing slot.

3. The device as set forth in claim 1, wherein said abutment means on the cover means in the closed position of said cover means is disposed at a distance from its engagement surface on said feeding means, so that said abutment means in the opening movement of the cover means does not engage said feeding means until after a predetermined amount of initial movement of said cover means.

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