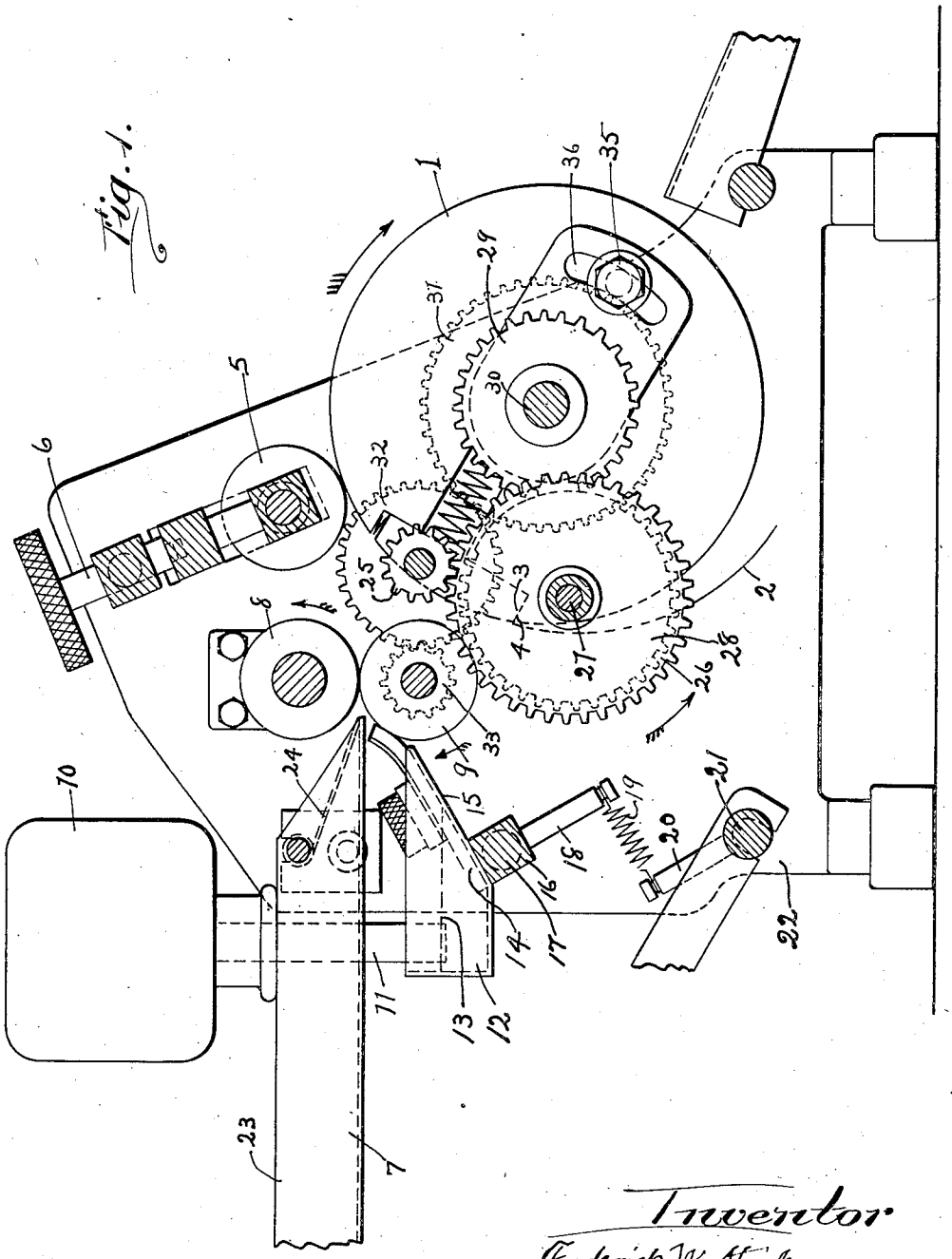
Jan. 15, 1935. F. W. STORCK 1,988,056

METHOD AND APPARATUS FOR DUPLICATING PRINTED MATTER

Original Filed July 25, 1931 2 Sheets-Sheet 1

Fig. 1.



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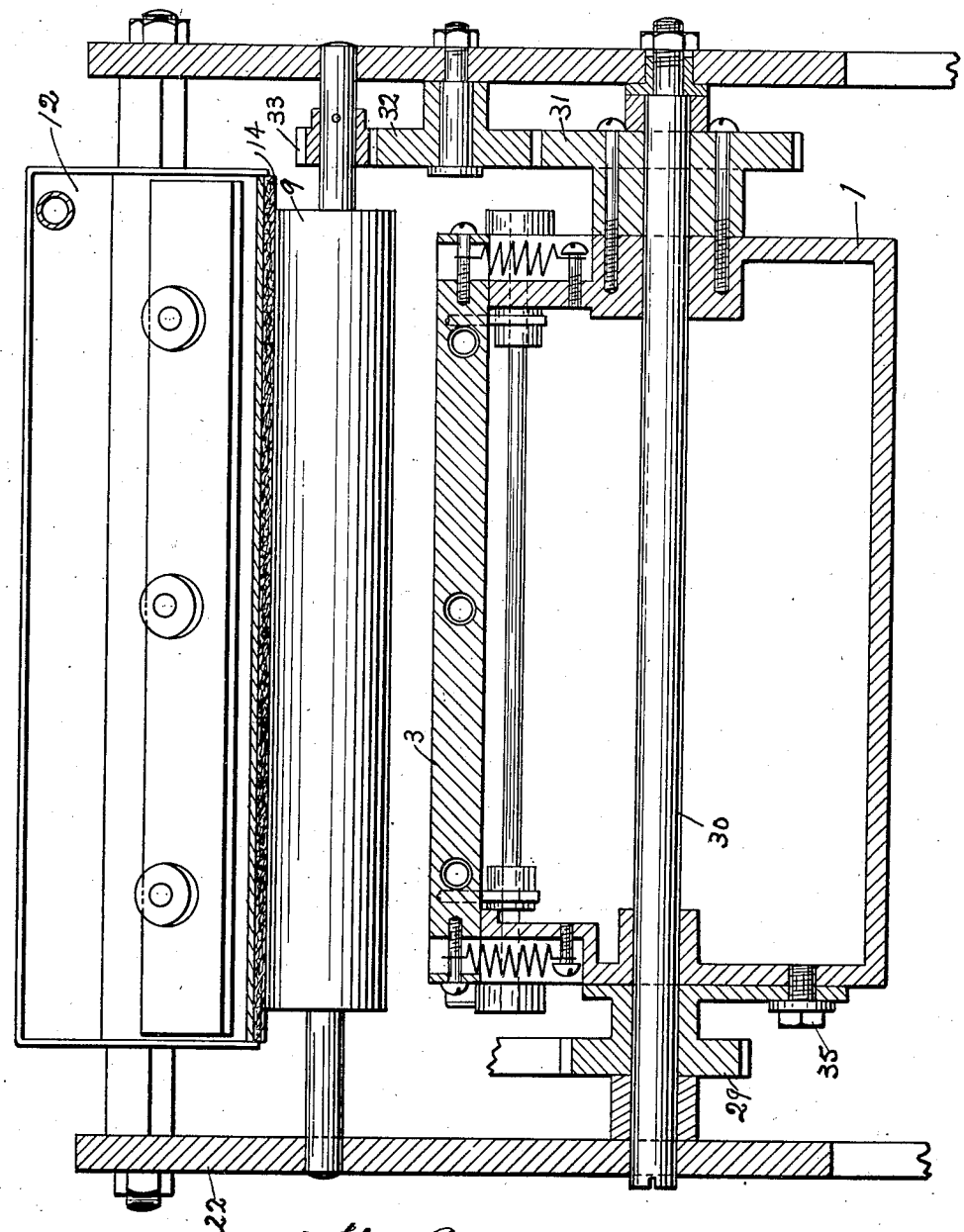


Fig. 2

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Patented Jan. 15, 1935 1,988,056

UNITED STATES PATENT OFFICE

1,988,056

METHOD AND APPARATUS FOR DUPLICATING PRINTED MATTER

Frederick William Storck, Arlington, Mass., assignor to Standard Mailing Machines Company, Everett, Mass., a corporation of Massachusetts

Application July 25, 1931, Serial No. 553,204
Renewed August 1, 1934

5 Claims. (Cl. 101—132)

My invention relates to the method or process of producing duplicate copies of printed, written and drawn records made with copying ink.

The objects of my invention are to devise a method or process and machines by which I can attain the following results: Duplicate copies that are clear, well defined and uniform in density throughout each and every copy; to control the moisture imparted to each sheet and prevent their being wrinkled or distorted, and to regulate the amount of ink taken up by each duplicate sheet, in order that a greater number of duplicate copies may be made from each master copy; to devise a method and provide means whereby duplicate copies may be made on a sheet in accurate alignment with matter previously printed on said sheet.

A master reverse copy may be prepared in either of the following ways; by printing a master copy in a printing press from type set up positive, rather than negative, as is the usual practice, then printing the master sheet on its exposed surface with copying ink to produce a negative copy; by setting up the type negative as usual then pressing the type against a clear sheet of paper having a sheet coated with copying ink placed with its coated side against the back of the clear sheet of paper, the result will be a master copy made in reverse; by laying a sheet coated with copying ink on a smooth surface with the coated side up, then place the master sheet on the coated face of the coated sheet and write or draw the desired matter in the usual way on the master sheet with an instrument having a small smooth point, the result will be a negative copy.

The best results are obtained by using a smooth somewhat yieldable surface so the drawing or writing will be more or less embossed. Another way of making a reverse master copy is to place a sheet coated with copying ink upon a sheet of paper with the coated side against the paper, place them in a typewriter with the sheet of paper facing outward, print the desired matter in the usual way, the result will be a positive copy on the front of the sheet of paper and a reverse copy in copying ink, on the back of the paper. I do not claim the process of making a reverse master copy as part of my invention, as master reverse copies, have been made by the processes described herein by draughtsmen, architects and others in making records from which they wished to make duplicates.

It has been common practice for thirty years or more, to make reverse master copies of records with copying ink. The purpose of my invention is to devise means and methods that will make the production of any quantities of duplicate copies made from master reverse copies available to the public in an economical and practical way.

The method or process of making duplicate copies employed by me comprehends the use of a moistening fluid for moistening the clear sheets that will quickly diffuse over the entire surface of the clear sheets and rapidly evaporate and dry out without leaving a residue, such as 60% of ethyl alcohol and 40% tetrachloride or a mixture having similar characteristics.

All the objects are attained by the method of process herein described together with others set forth in these specifications.

In the drawings which accompany and form a part of these specifications: Fig. 1 is a side elevation of a duplicating machine by means of which, I carry out the method or process of making duplicate copies of printed, written and drawn records as herein described. Fig. 2 is a sectional plan of said machine.

As shown in the drawings 1 is the revolving platen to which the master copy of the record 2 is attached at one end between the clamping surfaces 3 and 4. 5 is a pressure roll for pressing a clear sheet against the master copy as the platen 1 is revolved and the two pass through in contact between the said platen 1 and pressure roll 5. 6 is an adjusting screw for varying the pressure of the pressure roll 5, against the printing platen 1.

In carrying out the method or process employed by me in making duplicate copies of records, I place the required number of clear sheets upon the support 7, each sheet being passed into contact with the feeding rolls 8 and 9, at their meeting points, upon rotation of the feeding rolls 8 and 9, and the printing platen 1, the clear sheet passes into contact with the master sheet 2 and is pressed against it as both pass between the pressure roll 5 and the platen 1. As the clear sheet passes between the feed rolls 8 and 9, it is moistened on its underside by its contact with the roll 9 which is a combined feeding and moistening roll.

In practice, I prefer to make the roll 8 of a fibrous yielding material that is absorbent, such as felt or the like. The roll 9 may be made of metal, porcelain, glass or like material. I have used both metal and porcelain with good results.

The moistening fluid is controlled and fed to

the roll 9 in the following manner. The inverted reservoir 10, which is provided with a suitable support not shown, a tube 11 is secured in the outlet of the reservoir 10, and projects downward into the fluid tank 12. 13 represents the fluid level in the tank 12 when the fluid level 13 is above the end of the outlet tube 11, the flow of fluid into the tank 12 will cease as the fluid will be held by barometric action as is well known. This action will maintain the fluid level in the tank 12, at any desired height, the level of the fluid being determined by the position of the lower end of the tube 11.

There is a fibrous material 14 secured to the sloping side of the tank, its lower edge being immersed in the fluid and its upper edge resting upon the surface of the roll 9. The fibrous material is supported by the flexible metal 15 which presses it against the roll 9. A bar 16 is secured to the bottom of the tank 12, its end being journalled in holes in the frame 22, by the journals 17.

A pin 18 is secured in the bar 16 and has a tension spring 19 secured to it at one end, the other end of the spring 19 is secured to the pin 20, which is secured in the rod 21. The rod 21 is frictionally mounted in the frame 22 so it may be rotated therein to increase or decrease the tension of the spring 19, and thereby increase or decrease the pressure of the fibrous material 14, on the roll 9.

The fluid is conveyed from the tank 12 to the roll 9 by capillary action through the fibrous material 14, its flow or the amount of fluid conveyed to and deposited on the roll 9 is controlled by the height of fluid in the tank 12, the thickness of the fibrous material and the pressure of the fibrous material 14 against the roll 9.

A shelf 23 is provided to support the clear sheets on which the duplicates are printed, the sheets being guided under the swinging apron 24 into engagement with the rolls 8 and 9 at their point of contact.

By using a yieldable fibrous material for the roll 8, I attain two desirable results; the yieldable roll 8 evenly presses the sheet against the roll 9 and causes its entire surface to be uniformly moistened; by use of a fibrous absorbent material for the upper roll 8, any surplus moisture, conveyed to the roll 9, by operating the duplicator without passing sheets through between the rolls is taken up by the absorbent roll 8, also any extra moisture that may accumulate on the roll 9 during the interval between the feeding of the sheets, is absorbed by the roll 8, thus maintaining the upper surface of the sheet substantially dry under all circumstances.

The printing on moistened sheets of duplicate copies of matter printed, written or drawn with copying ink is accomplished by revolving the printing platen 1 with the master copy attached to it to bring said master copy into contact with the moistened sheet under pressure, the moistened sheet being fed to the master copy by the combined feeding and moistening rolls 8 and 9.

The platen 1 is intermittently rotated by the gear 25 which enmeshes and drives the gear 26. The gear 26, is secured to the shaft 27, which shaft has also secured to it an intermittent gear 28 which enmeshes with the gear 29. The gear 29, is secured to the shaft 30, upon which the platen 1 is adjustably mounted. A gear 31 is secured to one end of the platen 1 and enmeshes with the gear 32 which in turn enmeshes with the gear 33 which is secured to the shaft 34 upon which the roll 9 is mounted. The gears 31, 32, and 33, are so proportioned that the peripheries of the platen 1, and the rolls 8 and 9, rotate at the same speed and each have the same intermittent movement, the purpose of such intermittent movement is to give a rest period to the platen and rolls while the clear sheet is positioned between the rolls 8 and 9, so it will be accurately positioned upon the master copy as they pass under the pressure roll 5.

The use of a quickly diffusing and penetrating fluid that evaporates and dries out rapidly together with the other means employed by me, enables me to produce duplicate copies printed either light or heavy as desired, copies uniform in appearance; duplicate sheets smooth and free from discolorations, from forty to fifty per centum more copies in a given length of time and approximately sixty per centum more clear, well defined, and legible copies from each master copy.

My method of moistening the copy sheets on the under surface by the use of barometric and capillary action is a radical departure and enables me to obtain results never before attained.

By employing capillary action and a rapidly diffusing and drying liquid the quantity of liquid conveyed to and deposited on the copy sheet can be controlled to give it a degree of moisture that enables the operator to produce a large number of duplicate copies printed light or medium, or a smaller quantity printed heavy; to use duplicate copy sheets of any thickness, coated or not coated, regardless of the material or composition of materials from which the copy sheets are made. By my method, uniform duplicate copies can be made on thin tissue paper with the same speed and facility as on card board or heavy paper.

The quantity of liquid deposited on the copy sheet is controlled by the height of liquid in the tank 12, the height of liquid being automatically maintained by barometric action, the quantity of liquid conveyed from the tank 12 to the roll 9, is regulated by the thickness and character of the fibrous material used in the pad 14, the flow of liquid for a given pad is uniform. By using a highly volatile quickly diffusing liquid its flow by capillary action is rapid and it diffuses over the surface of the roll 9 evenly and quickly. The highly volatile character of the moistening fluid used by me and the absorbent roll 8, which will take up such fluid and from which it will evaporate rapidly, prevents the accumulation of excess moisture on the roll 9, during idle periods, with the result that the printing on the duplicate copy sheet will be uniform, clearly defined and legible.

Another important feature is the inclusion of means to adjust the pressure of the pressure roll 5, to give it a light or heavy pressure against the printing platen 1. To increase or decrease the amount of moisture deposited on the copy sheet would not make a very noticeable difference on the appearance of the duplicate copy unless the pressure on the pressure roll was increased or decreased at the same time.

In carrying out my improved method of making duplicate copies from a master copy printed, written or drawn with copying ink, if a large number of light legible copies is desired, the lower end of the tube 11, is lowered in the tank

12, to lower the fluid level, the tension of the spring 19, is increased and the adjusting screw 6 is changed to decrease the pressure of the roll 5, on the platen 1, these adjustments result in less ink being dissolved and taken up by each moistened clear sheet and a much greater number of copies being produced before the ink on the master copy is exhausted. Should heavy duplicate copies be desired the reservoir outlet is adjusted to raise the fluid level, the tension of the fibrous pad 14 on the roll 9, is lessened thus increasing the moisture deposited on the clear sheet, the pressure of the roll 5 on the platen 1 is increased thereby taking up more ink on each clear sheet and fewer but heavier copies made.

When it is desired to make duplicate copies of printed, written or drawn records on sheets having matter previously printed thereon, means are provided for adjusting the periphery of the platen 1, with relation to the peripheries of the rolls 8 and 9, which consists of the arm 34, which is secured to the gear 29, and the binding screw 35 which passes through the slot 36 in the arm 34 and is threaded into the end wall of the platen 1. By loosening the binding screw 35 the arm 34 may be moved either way until the desired adjustment is made, the screw 35 is then tightened down.

Through employment of means for moistening the clear sheet on the under side the duplicate printing, is done at the top of the platen 1, this permits attachment of the master copy to the platen 1, so it will hang down and be maintained flat free from wrinkles by its own weight as it approaches contact with the moistening clear sheet at the point where they pass between the platen 1 and the pressure roll 5, this is one of the features that enables me to make duplicate copies of good appearance, and speed up the operation of the machine.

I do not confine my invention to a duplicating machine of the form or arrangement of parts shown herein as any machine which will permit me to follow the methods claimed herein will come within the spirit of my invention.

What I claim is:

1. In a copy multiplying device, a master copy drum and a pressure roll co-acting therewith, feeding means comprising an absorbent compression roller and a non-absorbent damping roller and means for conveying moisture to said damping roller.

2. In a copy multiplying device, a master copy drum and a pressure roll co-acting therewith, feeding means comprising an absorbent compression roller and a non-absorbent damping roller and means for conveying moisture to said damping roller by capillary action.

3. In a device for making duplicate copies of printed matter, a master copy drum and a pressure roll co-acting therewith, means for feeding and dampening clear sheets, comprising a non-absorbent non-corrosive dampening roller capable of withstanding the destructive action of volatile liquids and an absorbent flexible roll that will prevent the accumulation of excess moisture at the point of contact of said rolls if revolved without the insertion of paper between them.

4. In a device for making duplicate copies from a master copy, a master copy drum and a pressure roll co-acting therewith, means for feeding and dampening clear sheets, comprising a flexible absorbent roll and a non-yielding non-absorbent dampening roll capable of withstanding the corrosive action of volatile liquids.

5. The method of multiplying copies comprising forming a master copy sheet with ink characters in reverse, uniformly subjecting one face of a sheet to be printed to a predetermined quantity of moisture under all working conditions, disposing said sheets in engaging relation and subjecting such sheets to pressure.

FREDERICK WILLIAM STORCK.