June 23, 1942. L. F. HAGEMAN 2,287,426

HOT CARBON SPOTTING APPARATUS

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Fig. 1.

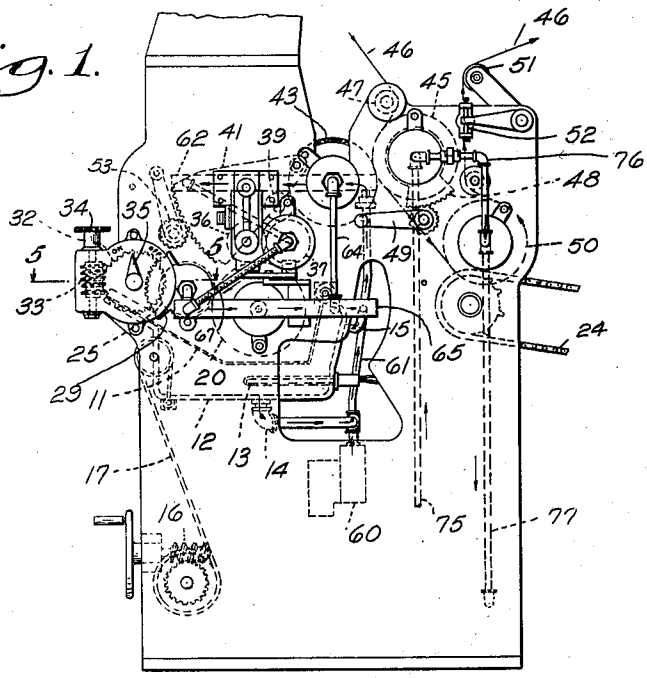


Fig. 2.

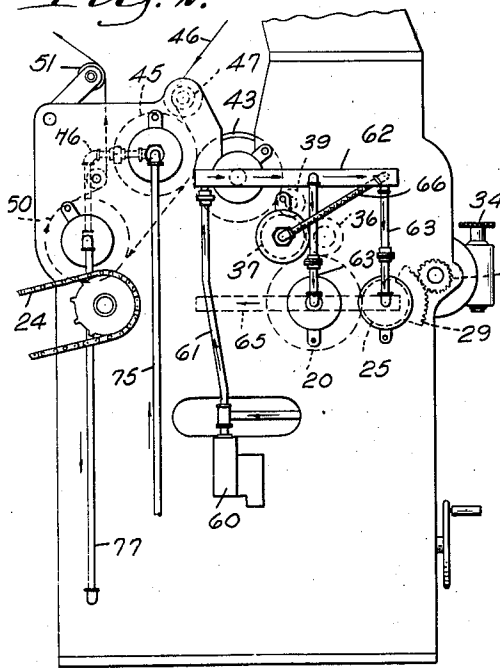
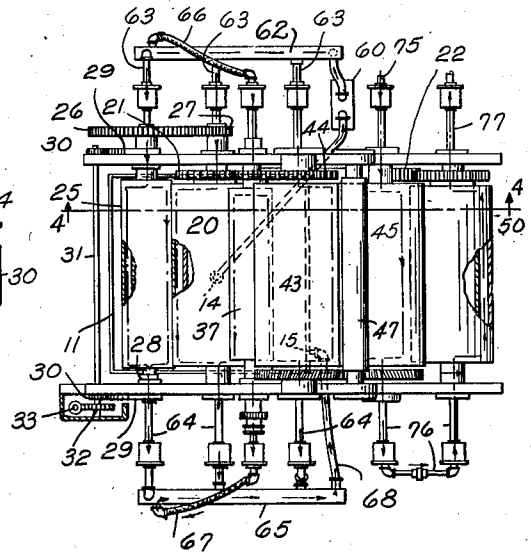


Fig. 3.



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Fig. 4.

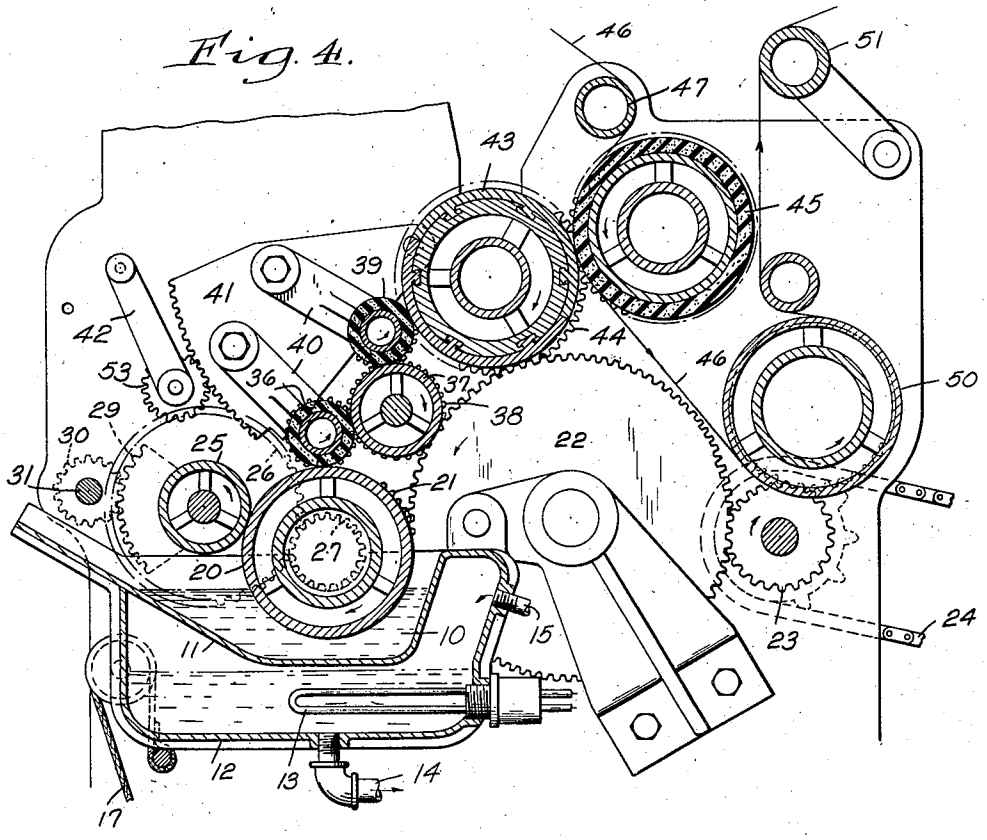


Fig. 5.

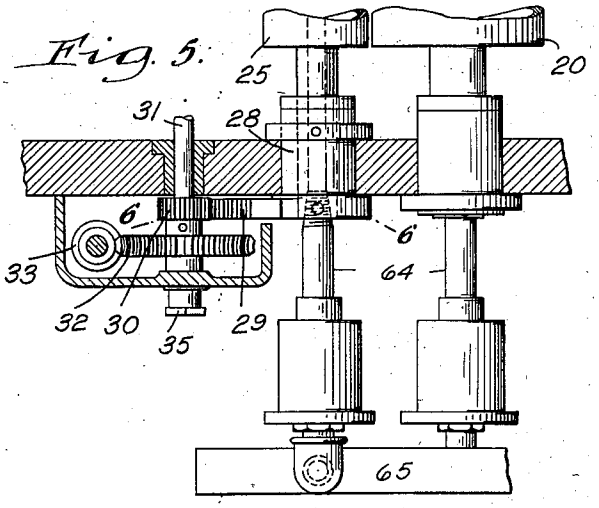
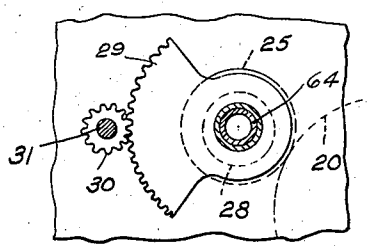


Fig. 6.



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UNITED STATES PATENT OFFICE

2,287,426

HOT CARBON SPOTTING APPARATUS

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Application November 19, 1938, Serial No. 241,386

5 Claims. (Cl. 91—50)

This invention relates to an improved apparatus for applying carbon transfer, or duplicating, material to stationery. It has particular reference to the application of separate carbon spots at desired locations on long continuous webs of paper which are to be used in the manufacture of manifold stationery but it will be understood that the improvements described herein may be used to apply transfer material continuously to paper webs, as opposed to separate areas.

Sometimes in the use of such stationery, whether it be in long continuous strips, or in relatively short sections, it is desired that certain data may be entered upon some, but not all, of the manifold sheets, while other data is to be entered upon all the sheets. While using separate carbon sheets, or paper which has been carbon coated on the reverse side, such entries can be made by applying a mask to the areas to be protected, or by using carbon sheets having the carbon coated surface confined to the areas in which copying is desired. Ordinarily it is inconvenient to use masks which frequently result in smudging of the carbon. Specially coated carbon paper, as described, is expensive, has a generally unsatisfactory appearance, and its use is therefore confined to a relatively small variety of manifold stationery products. Accordingly it has been proposed to apply carbon materials in separate spots, or isolated areas, as required for the entries at the desired places, by a method which gives control of the carbon coating, and control of the paper to be treated with carbon, and which can also be readily and economically co-ordinated with the present common methods of printing, and is applicable to a wide variety of manifold stationery products.

It is an object of the present invention, therefore, to provide an apparatus whereby hot carbon material, frequently referred to as dope, and comprising wax, oil and coloring matter, may be applied at desired locations on continuous webs of paper intended for continuous manifold stationery or other stationery made by continuous methods.

A further object of the invention is to provide an arrangement whereby the amount of dope which is carried from the dope reservoir to the plate cylinder may be easily regulated without stopping the apparatus and a desired supply constantly maintained.

A still further object is to provide a system for supplying heat to the printing cylinder and to the various rolls conveying the dope to this cylinder so as to maintain the dope fluid until it is applied to the paper.

Further objects will be apparent and the invention will be better understood from the following description taken in conjunction with the drawings, in which

Fig. 1 is a side elevation of a preferred embodiment of the present apparatus,

Fig. 2 is a similar view of the opposite side of the apparatus,

Fig. 3 is a top view,

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 3,

Fig. 5 is a partial cross-sectional view taken along the line 5—5 of Fig. 1, showing the mechanism for positioning the dope regulating roll, and

Fig. 6 is another view of this mechanism taken along the line 6—6 of Fig. 5.

Referring particularly to Fig. 4, the supply of carbon transfer material, or dope, 10 is maintained in fluid condition in a reservoir, or pan, 11. As commonly used this dope consists of wax, oil and coloring matter and it is heated to approximately the range of 180°–200° F. to keep it sufficiently fluid to be applied to the paper. The level of dope in the dope pan may be kept substantially constant by suitable means such, for example, as a float-operated valve through which a supply of dope may be fed in accordance with the amount withdrawn from the pen.

The dope is maintained fluid in the dope pan 11 by a heated bath of oil in a reservoir 12. As illustrated, the dope pan 11 and the oil reservoir 12 may comprise a double walled structure with the dope in a trough formed by the upper wall and the oil between the two walls. This oil is heated by means of several electrical heating units 13 immersed in the oil and preferably controlled by thermostats in the dope reservoir so as to maintain the dope at the desired fluidity at all times.

As hereinafter described, this oil is circulated through most of the various rolls by which the dope is conveyed to the paper in order to maintain these rolls sufficiently warm to prevent chilling of the dope before it reaches the paper. The oil leaves the reservoir through the outlet 14 at the bottom and returns through the inlet 15 at the top.

As shown in Fig. 1, the dope pan and oil reservoir may be raised or lowered under the control of the hand operated worm and worm wheel mechanism 16 to which the oil reservoir is connected by means of the cable 17.

The arrangement of the rolls which convey the dope from the dope reservoir to the paper, now to be described, is best shown in Fig. 4. The dope roll 20 which may be steel, is so positioned with respect to the dope pan 11 that it dips into the heated dope. As illustrated, about one quarter of its circumference is immersed in the dope but this ratio is not critical and may be either larger or smaller so long as sufficient dope clings to the surface of the roll as it is rotated and is lifted out of the dope pan. This roll is rotated by

means of a gear 21 at one end of the roll in engagement with a large driving gear 22. The latter is used to rotate several other rolls in the system, as hereinafter described, and receives its power from the gear 23 which in turn receives power through a chain drive 24 from the main press or other suitable source.

The amount of dope which is lifted from the dope roll 20 as it rotates clockwise, as shown in Fig. 4, is not necessarily constant and for most purposes would be excessive in amount. Accordingly, means are provided for removing the excessive dope raised by the dope roll and controlling the amount of dope which is transported through the roll system to the paper. Such control is variable because different orders will require varying amounts of carbon to be deposited on the paper. The following regulating arrangement has been found very satisfactory.

A steel regulating roll 25, positioned so that it lies above the dope in the dope pan at all times, runs in contact with the dope roll 20. It may be, and preferably is, about one half the diameter of the dope roll and is driven by the gear 26 on the ends of its shaft (see Fig. 3) meshing with the smaller gear 27 on the dope roll shaft. These gears, 26 and 27, are so proportioned that the regulator roll rotates slower than the dope roll, say, for example, having a surface speed about one-quarter as fast, although this is not a critical ratio.

The amount of dope which the regulator roll permits to pass beyond its line of contact with the dope roll and thence go to the paper, depends on the distance between the centerlines of the dope and regulator rolls, or in other words, on the thickness of the dope film which can pass between these two rolls. In effect, it is a revolving ductor blade. Preferably the position of the dope roll is fixed while that of the regulator roll may be adjusted, without stopping the apparatus, by means of the mechanism shown more clearly in Figs. 1, 3, 5, and 6. Referring first to Figs. 5 and 6, it will be observed that the journals of the regulator roll 25 are mounted in eccentric bearings 28 which are integral with the sector members 29, the latter being provided with gear teeth as illustrated. As these eccentric bearings are rotated in one direction or the other, they cause the regulator roll to be moved toward or away from the dope roll depending on the direction of rotation of the sector members 29. The latter are rotated by the pinions 30 on the transverse shaft 31 which has a worm wheel 32 at one end engaging the worm 33. This worm is rotated by the handle 34 (Fig. 1) and the extent of movement of the regulator roll toward or away from the dope roll may be observed from the movement of the pointer 35 carried by the end of the transverse shaft 31. With the arrangement described it is possible to make very fine adjustments in the relative positions of the dope and regulator rolls between a setting which, as a practical matter, does not permit any dope to pass, and one which passes a film of dope about $\frac{1}{32}$" thick.

As the dope roll continues to rotate after its contact with the regulator roll, it carries with it the selected amount of carbon material which it delivers to a so-called transfer roll 36 having a suitable coating, such as rubber, or a rubber substitute. It will be noted that this material is transferred at a point removed from the regulator roll and entirely independently of it. This arrangement has been found to give much better regulation and more uniform distribution of dope than where a single roll serves both purposes, as has been proposed. From the transfer roll the dope is conveyed to a steel vibrator roll 37 which is made to reciprocate axially by suitable means well known in the printing industry and at the same time rotates because its associated gear 38 meshes with the driving gear 22. These movements distribute the dope uniformly on a form roll 39 which is also preferably covered with a rubber-like substance. Both the transfer roll and the form roll are driven by the vibrator gear 38 as indicated.

The following arrangement is provided to withdraw the transfer roll 36 and the form roll 39 from contact with the vibrator roll 37, the dope roll 20 and the printing cylinder 43 when the apparatus is not in use. The transfer roll 36 and the form roll 39 are supported at the ends of arms 40 carried by the toothed sector members 41 which are pivoted near the ends opposite the teeth. The sector members may be raised by rotation of the pinions 53 which are caused to rotate by swinging movement of the lever 42 as will be readily understood.

The form roll spreads the carbon material on the plate roll or printing cylinder 43 having carbon-applying surfaces of the required design to print the carbon spots at equal distances along the paper web. This cylinder is driven by the gear 44 which engages the large driving gear 22. When plated, this cylinder is preferably slightly greater, or slightly smaller, in diameter than the dope roll and the dope roll gear 21 may have a correspondingly slightly different number of teeth from the printing cylinder gear 44, in order to give a "creeping" effect whereby more uniform distribution of dope on the printing cylinder is obtained.

The impression cylinder 45 which is given a suitable impression surface by a covering of a rubber-like substance, is fluid cooled as hereinafter described, to chill the paper in contact with it so as to prevent the heated dope from penetrating too deeply into the paper and to prevent smudging in the subsequent operations. The paper web 46 enters from the top of the apparatus and after passing around the guide roll 47 is wrapped around the impression cylinder to obtain this cooling effect. As illustrated, the paper may contact the impression cylinder for approximately 90° although it may be found advisable to vary this amount of contact depending upon the speed of the paper, temperatures of the dope and cooling fluid, and other factors. It will also be noted that the paper has only tangential contact with the plate cylinder. As shown in Fig. 1, the impression cylinder journals are mounted in eccentric bearings integral with sector members 48 controlled by movements of the lever 49 in a similar manner to the bearing arrangement for the dope regulator roll, previously described. Thus the position of the impression cylinder may be adjusted for printing the carbon spots on different weights and grades of paper.

As has been known for many years, the plate cylinder and the paper may travel in the same direction and they may have the same surface speed, if desired, or the surface speed of the plate cylinder may be either faster or slower than that of the paper. After receiving the carbon from the plate cylinder, the paper may be wrapped around a cooling drum 50 which is rotated by the gear 23 as shown. In some instances

it may be found desirable to wrap the paper around this drum for a substantial arc, say 270°, while in other cases, the drum may be omitted altogether. If the web is to be subjected to further operations, such as printing, folding, rewinding, cutting, etc., to which it is desirable to synchronize the feed, the web may pass out of the carbon-applying apparatus over a register roll 51 whose position may be varied at will by means of screw adjustment 52 to control the feed of the paper for such operations.

The system for circulating heated oil through most of the dope-conveying rolls to maintain the dope sufficiently fluid during its travel to the paper, will now be described with reference to Figs. 1, 2 and 3. This oil flows from the reservoir 12 through the outlet 14 to a pump 60 which forces the oil upward through the pipe 61 to a header 62 from which the oil flows by gravity through the pipes 63 to the dope and regulator rolls and the printing cylinder. Each of these three members is a double-walled structure as may best be seen from Figs. 3 and 4. The oil heats these members as it passes through them and then leaves through the outlet pipes 64 connected to a return header 65. As the vibrator roll reciprocates crosswise, its ends are connected with the inlet and outlet headers by the flexible inlet and outlet connections 66 and 67, respectively. From the outlet header 65 the oil returns through the pipe 68 to the inlet connection 15 at the top of the oil reservoir 12 where it is again heated for recirculation. Suitable valves may be placed wherever desired in this circulatory system for controlling the flow of oil and the inlet header 62 may be provided with an overflow pipe.

The circulating system for cooling the impression cylinder 45 and the cooling drum 50 is also shown in Figs. 1, 2 and 3. Cold water, or other cooling medium, is supplied through the pipe 75 and flows through the double-walled impression cylinder 45, then through the piping 76 to the cooling drum 50. After passing through this drum which is also double-walled, it flows through the outlet pipe 77, to waste, or for cooling and recirculation.

For convenience, the appended claims refer to the material to be applied to the paper as "carbon material" but this expression is to be taken to include all duplicating materials with which the present invention may be employed regardless of whether they actually contain some carbon.

I claim:

1. Apparatus for applying isolated carbon spots to moving stationery comprising, a dope roll for raising melted carbon material from a supply thereof, a regulating roll cooperating with the dope roll for controlling the amount of material carried forward by the dope roll, means for rotating said dope and regulating rolls at different surface speeds relative to each other, a plate cylinder for transferring said carbon material to the stationery, means operating independently of the regulating roll for conveying the carbon material from the dope roll to the plate cylinder, an impression cylinder and means for rotating said plate and impression cylinders at different surface speeds relative to each other.

2. Apparatus for carbonizing isolated areas on moving stationery comprising, a dope roll for raising melted carbon material from a supply thereof, a regulating roll cooperating with the dope roll for controlling the amount of material carried forward by the dope roll, a plate cylinder for transferring said carbon material to the stationery, an impression cylinder, means for rotating said dope and regulating rolls at different surface speeds relative to each other, means for rotating said dope and plate rolls at different surface speeds relative to each other and means for rotating said plate and impression cylinders at different surface speeds relative to each other.

3. Apparatus for applying isolated carbon spots comprising, a dope roll rotating partially submerged in, and adapted to raise, melted carbon material from a supply thereof, a regulating roll cooperating with the dope roll, to control the thickness of film carried past by the dope roll, means for rotating the regulating roll at slower surface speed than the dope roll, means operable during rotation of the regulating roll to vary its position with respect to the dope roll whereby the thickness of said film is controlled, a plate cylinder applying carbon material to the stationery, a series of rolls for transferring the carbon material from the dope roll to the plate cylinder, means for moving one of said series of rolls axially and means for rotating said dope roll and plate cylinder at different surface speeds relevant to each other.

4. Apparatus for applying isolated carbon spots to moving stationery comprising, a dope roll for raising melted carbon material from a supply thereof, a regulating roll cooperating with the dope roll for controlling the amount of material carried forward by the dope roll, means for maintaining the axis of rotation of said regulating roll in a fixed position relative to that of said dope roll, means for rotating said dope and regulating rolls at different surface speeds relative to each other, a plate cylinder for transferring said carbon material to the stationery, an impression cylinder, means cooperating with said dope roll directly and independently of said regulating roll for conveying the carbon material from the dope roll to the plate cylinder, means for rotating said plate cylinder and said dope roll at different surface speeds relative to each other, and means for rotating said plate and impression cylinders at different surface speeds relative to each other.

5. Apparatus for applying isolated carbon spots to moving stationery comprising, a dope roll for raising melted carbon material from a supply thereof, a regulating roll cooperating with the dope roll for controlling the amount of material carried forward by the dope roll, means manually operable during rotation of said dope and regulating rolls for shifting the axis of rotation of one of said rolls with respect to that of the other and for maintaining the first-mentioned axis of rotation in said shifted position until further manual operation of said means, means for rotating said dope and regulating rolls at different surface speeds relative to each other, a plate cylinder for transferring said carbon material to the stationery, an impression cylinder, means cooperating with said dope roll directly and independently of said regulating roll for conveying the carbon material from the dope roll to the plate cylinder, means for rotating said plate cylinder and said dope roll at different surface speeds relative to each other, and means for rotating said plate and impression cylinders at different surface speeds relative to each other.

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