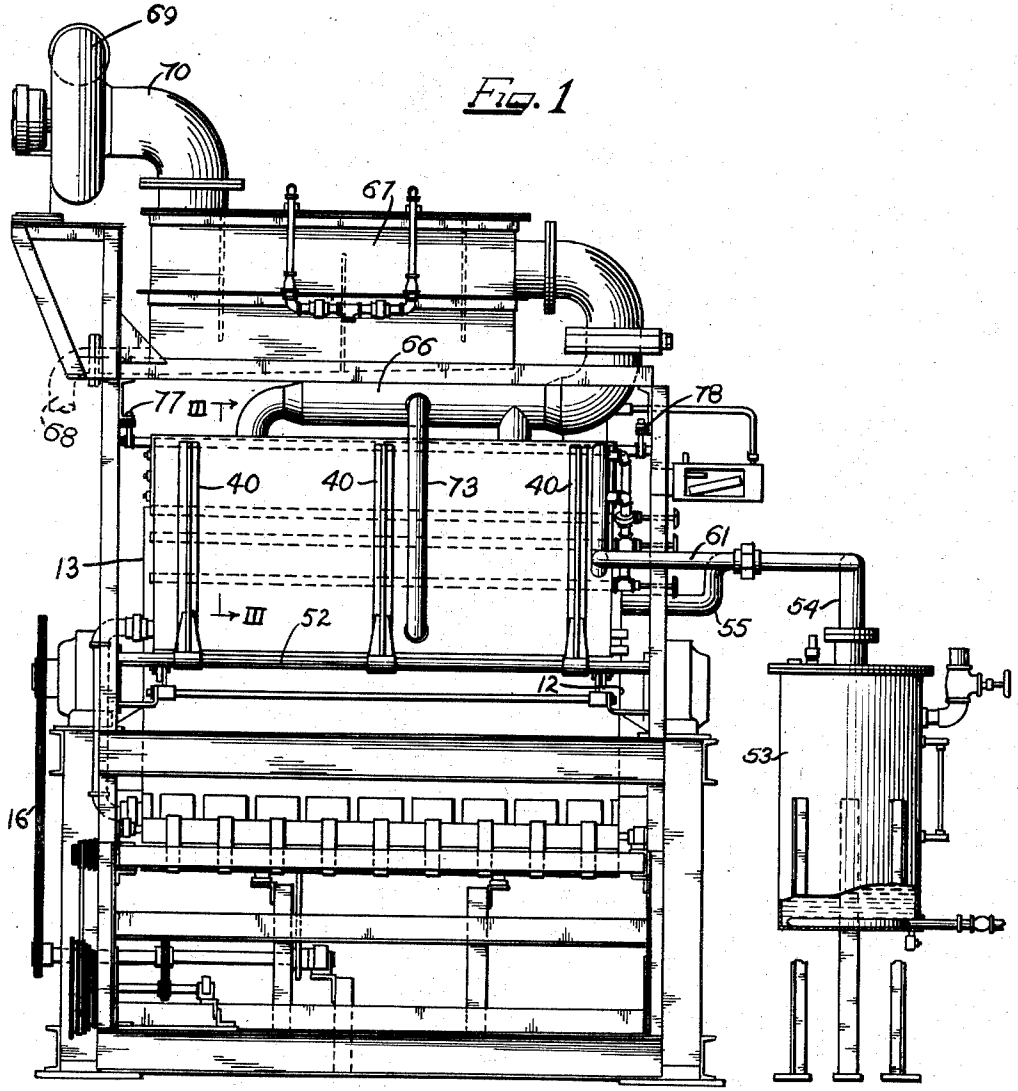
Oct. 17, 1950 F. FELDMEIER 2,526,012

MULTICOMPARTMENT TREATING CHAMBER

Filed May 28, 1947 4 Sheets-Sheet 1

Fig. 1



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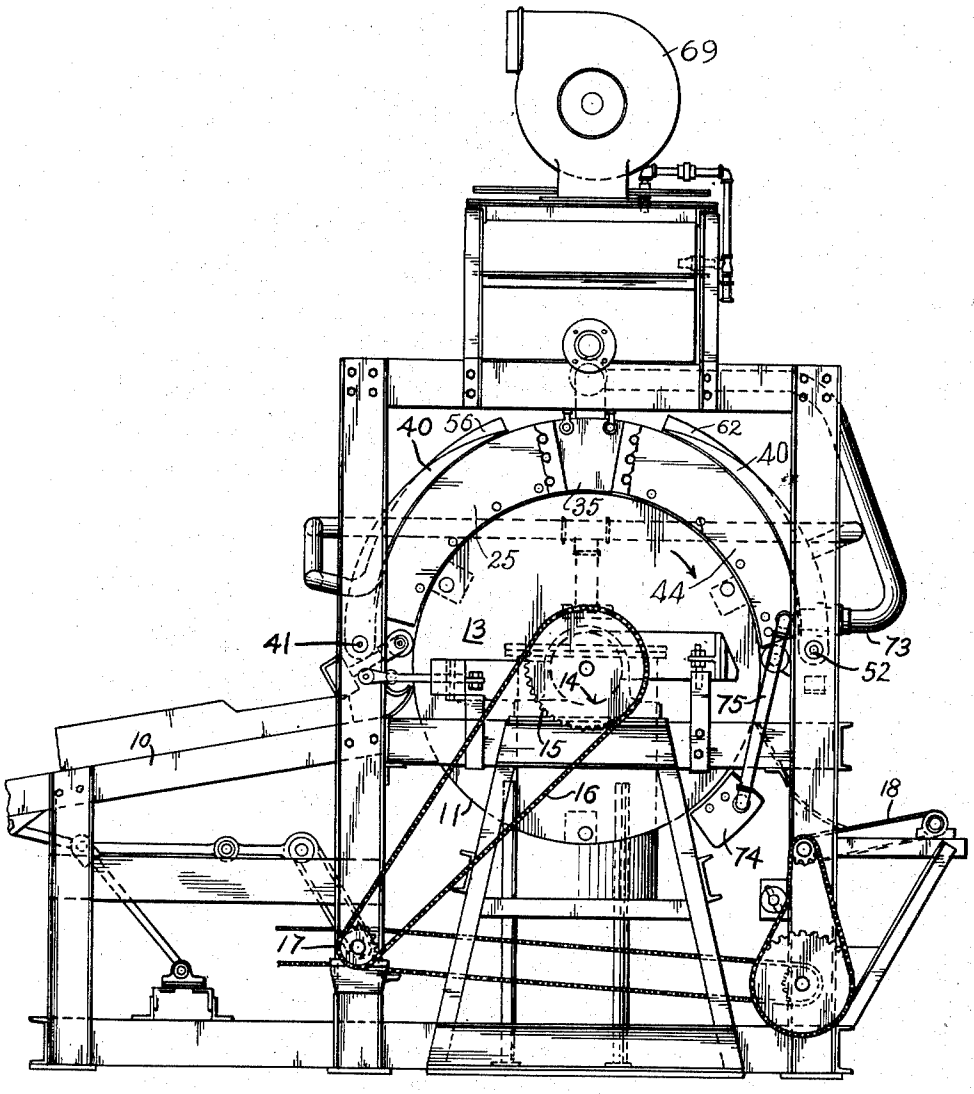
by The Firm of Marshall & Schiff
Attys.

Oct. 17, 1950 F. FELDMEIER 2,526,012

MULTICOMPARTMENT TREATING CHAMBER

Filed May 28, 1947 4 Sheets-Sheet 2

Fig. 2



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MULTICOMPARTMENT TREATING CHAMBER

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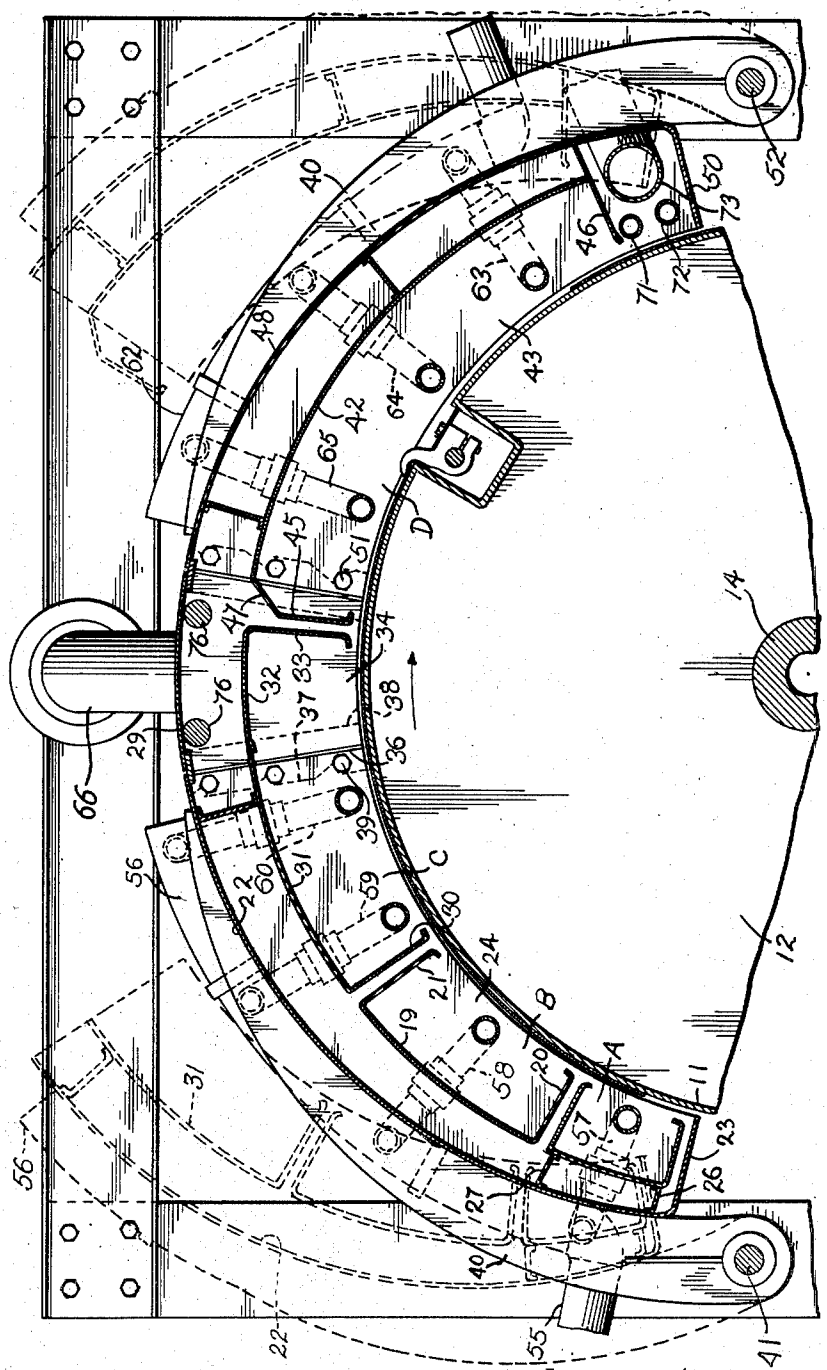


Fig. 3

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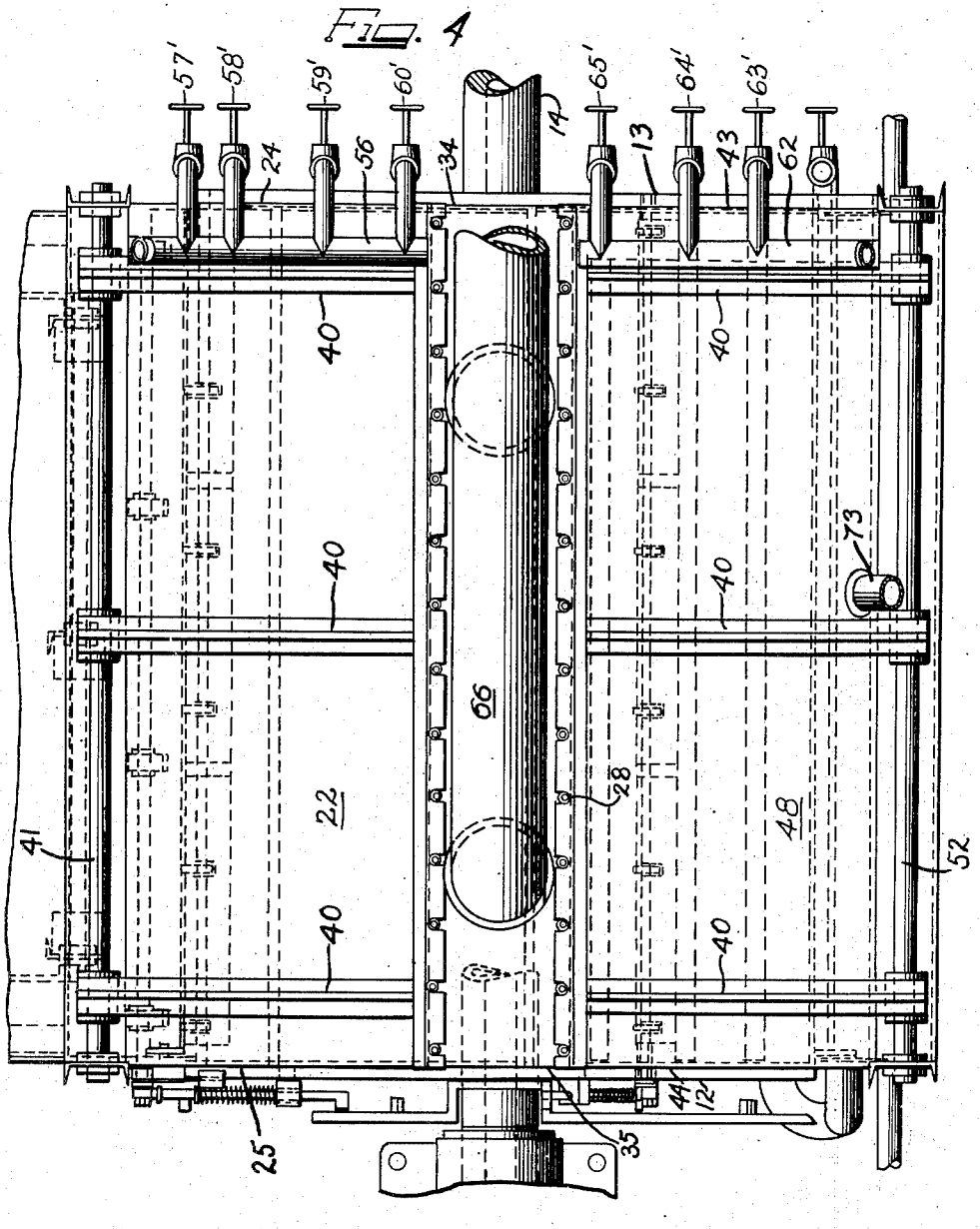
by Thel Sims of Charles Fahlberg Attys.

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MULTICOMPARTMENT TREATING CHAMBER

Filed May 28, 1947 4 Sheets-Sheet 4

FIG. 4



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2,526,012

MULTICOMPARTMENT TREATING CHAMBER

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Application May 28, 1947, Serial No. 751,149

2 Claims. (Cl. 91—55)

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This invention relates to apparatus for effecting the hardening of deposits, coatings and films of ink and other fluid compositions, and more particularly to apparatus for subjecting traveling sheets having such coatings thereon to the action of one or more treating agents for effecting the rapid hardening, or drying of such coatings.

In order that the nature of the invention, the manner of its use and the advantages obtainable therefrom may be more readily grasped, I shall explain hereinafter the use of this apparatus as applied to one industrial problem, that is, the hardening and drying of coatings of inks and other liquid compositions employed in the manufacture of decalcomanias. However, following a perusal of the complete specification, it should be apparent that this invention is readily adaptable to other industrial uses and that it may be employed for hardening, drying, or altering the compositions of various types of coatings whether of a liquid, semi-liquid, granular or other nature and whether applied by printing methods, spraying, or other possible methods of depositing such coatings or compositions upon sheet material. As the invention contemplates the use of a plurality of treating zones it may be understood that the treating agent or agents operating in one or more of the zones may be of a gaseous or vaporous nature accompanied or unaccompanied by the use of heat or light rays. All such uses and modes of operation are contemplated.

To illustrate the need for the invention and the advantages obtainable therefrom it may be stated that heretofore in the manufacture of decalcomania transfers, it has been customary to dry the decalcomanias by exposure to the atmosphere. The drying time for such a method ranges from overnight to as long as five days, depending upon the fullness of the form, the color of the ink being run, the composition and properties of the color that may have been previously applied to the sheet, and numerous other factors. It may correctly be surmised that when any substantial production is being obtained under such conditions, a considerable amount of floor space must be used in the storage of the printed sheets while drying, and particularly is this true where the printed sheets have to be racked in comparatively shallow stacks. In addition, there is the labor expense incident to handling the stacked sheets and periodically folding and winding the sheets to give the printed matter access to the air and thus effect a drying of the coating more uniformly and more rapidly.

It has been proposed that the freshly printed

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decalcomania sheets be subjected to the action of sulphur dichloride in vapor form, since the action of sulphur dichloride has been found to effect a very rapid drying of the ink compositions. It is understood that the drying, or hardening effect, has been found to be due to the chemical reaction between sulphur dichloride and the organic compounds present in the ink compositions. As the present invention is not concerned with the theories or details of those chemical reactions, they will not be further discussed herein. However, two important factors connected with the use of such a vapor are importantly related to the design of this apparatus and its use.

For example, when sulphur dichloride vapor is used in this apparatus the coating of ink composition on such decalcomania sheets can be dried in a relatively short time, on the order of ten seconds or less with certain ink compositions and on the order of thirty seconds or less with other ink compositions. Accordingly, the duration of treatment is related to the area of the treating zone, and in a single apparatus made in accordance with this invention the duration of treatment may readily be varied over a considerable range by the use of one or more treatment zones.

Another factor closely related to the chemical reaction is that the application of the treating agent is advisedly closely controlled and confined so that it may not harmfully affect any surfaces such as the uncoated side of the sheets being conveyed through the machine. Also, since the chemical reaction is rapid, not only should the period of treatment or exposure be terminated sharply, but provision should also be made for the removal from the composition under treatment of any vapors which may cling thereto as the sheet of material moves out of the last treating zone. Briefly, this last factor is met by passing the treated sheet through a final zone in which an air blast may be impinged against the composition surface to displace any clinging vapors, such vapors and air being quickly evacuated from such final zone.

It will be apparent that this apparatus may be used for the drying, hardening or other treatment of coated sheet material other than decalcomanias, and may employ treating agents other than sulphur dichloride.

It is, therefore, an object of this invention to provide apparatus suitable for the rapid treatment of coated materials under closely controlled conditions.

It is another object of this invention to provide

apparatus especially adapted for treatment processes of the character described, providing means in such apparatus for readily varying the size of the treatment zone.

It is another object of this invention to provide an apparatus of the character described in which the duration of treatment may be varied even though the sheet material is fed therethrough at a fixed rate.

It is another object of this invention to provide an apparatus of the character described having readily adjustable means for varying the length of treatment of material passing therethrough, together with means for preventing excessive treatment and undesired or harmful reactions on the material being processed.

Another object of the invention is to provide an apparatus of the character described having various or all of the foregoing advantages and further designed for convenient operation, inspection and maintenance.

Other and further objects and advantages of the invention will be mentioned hereinafter or will become apparent from a perusal of the specification and drawings in which a preferred embodiment of the invention is shown and described for the purpose of illustrating the nature of the invention and the manner of its use.

On the drawings:

Figure 1 is a rear elevation of an apparatus made in accordance with this invention;

Figure 2 is an end elevation of the same apparatus viewed from the left end of Fig. 1;

Figure 3 is a partial vertical sectional view on a plane through the line III—III of Fig. 1; and

Figure 4 is a top plan view of the apparatus.

The apparatus includes a drum on which individual sheets to be treated are placed and are fed through the machine, together with gas treating chambers mounted in close proximity to the drum, whereby the material passing through the machine is exposed to the gas while held upon the drum.

Accordingly, a feed table 10 is positioned for delivering the material to a drum 11. The mechanism for feeding the sheet material in a controllable manner to the drum does not constitute a part of the present invention, hence will not be described herein. Also the particular mechanism for gripping individual sheets to hold them on the drum is neither shown or described herein. A preferred mechanism of that character is shown in my copending application Serial No. 751,151 filed simultaneously herewith on May 28, 1947, although it should be understood that other means may be employed for holding the individual sheets upon the drum.

The drum itself is a cylindrical member supported by its end walls 12 and 13 upon a shaft 14 and is affixed to the shaft for rotation therewith. The shaft may be a hollow shaft, supported in suitable bearings at its opposite ends, the construction of which do not form a part of this invention. A sprocket gear 15 may be secured to this shaft, and a chain 16 meshing with sprocket gears 15 and 17 imparts rotation to the drum. A conveyor belt 18 for taking off the dried prints is shown. Motive power for driving the sprocket and chain driver will be supplied in any suitable manner, but not forming a part of this invention need not be herein shown and described.

Chambers for containing the vapor employed in treating the sheet material are shown in Figure 3 and are indicated generally as A, B, C and D. These chambers are in the form of sheet metal hoods each having an upper wall such as 19 and side walls 20 and 21, the side walls terminating close to the drum but spaced apart therefrom sufficiently to permit the free passage of the sheet material carried on the drum. These chambers are in general supported at their ends on arcuate plates which constitute the end margins of hinged tiltable units which include the gas chambers and the exhaust chambers which embrace them.

Referring to the feed end of the machine as the front of the machine, the front tiltable unit comprises the exhaust hood cover sheet 22 which has a lower inwardly turned flange 23 extending into close proximity to the drum surface, and vertical end walls 24 and 25. The chambers A and B are connected at their ends to the end walls 24 and 25, while the chamber A is supported at intervals, additionally, upon the sheet 22 by means of a plurality of brackets such as 26 and 27.

The chamber C cannot be rotated in its entirety along with the front unit because of the fact that the exhaust pipes and the central exhaust hood are more conveniently formed as a stationary unit. Accordingly, as shown in Figures 3 and 4 the swingable sheet 22 will overlap and be tightened down by nuts 28 upon the stationary sheet 29 which forms a part of the stationary hood.

The gas chamber C is formed of an end wall 30 which may be supported between the two vertical end plates 24 and 25 of the swingable unit, while a portion of the roof 31 of this chamber will likewise be supported between the end plates 24 and 25 and its longitudinal edge will terminate in an overlapping relation with the stationary roof member 32. A vertical flange 33 secured between end walls 34 and 35 of the stationary hood will thus serve to complete the gas chamber C.

In order to afford a tight juncture with the stationary hood the side walls 24 and 25 of the swingable front unit will abut vertical edges of the stationary walls 34 and 35, for example as indicated at the line 36, as shown in Figure 3. A plate 37 whose vertical margins are indicated as 37 and 38 may be welded to the outer surface of the wall 34 and a similar plate to the wall 35 and provided with the inclined notches as shown to receive the bolts such as 39 which are carried on the end walls of the hinged unit. It is apparent that when this hinged unit is rotated downwardly into closed position these bolts will move into the notches and nuts on them may then be tightened to provide a gas tight joint. At the position of the horizontally extending joints where the sheet 22 overlaps the sheet 29 and where sheet 31 overlaps sheet 32 it is preferred to provide rubber gaskets to afford leak proof seals.

Attached to the curved sheet 22 by welding, riveting or other suitable means, are a plurality of curved ribs such as 40, the lower ends of which are pivotally supported upon a hinge pintle 41 carried by the apparatus frame. Hence the entire front hinged unit may be rotated to open position, as shown by the dotted lines in Figure 3, to permit access to the chamber interiors and the drum surface.

As is indicated in Figure 3 the gas chambers A, B and C, just described, have successively increasing arcuate or angular dimensions. A fourth gas chamber D has an even greater arcuate dimension and is constructed as follows: The roof 42 of chamber D is supported between end vertical plates of the hinged tiltable unit

(similar to plates 24 and 25 and similarly locked) at the rear side of the drum. The walls 45 and 46 extend inwardly from the roof 42 and terminate at a short distance from the drum and are likewise supported between the end plates of the tiltable unit. The unit is so designed that the entire gas chamber D, unlike the gas chamber C, may be moved unitarily with the hinged unit of which it is a part, the inclined edge 47 thereof being so shaped to permit the gas chamber to pass out from under the roof 29 of the stationary chamber when the unit is being opened up. A roof 48 for the exhaust chamber is positioned as shown and has an overlapping joint at 49 for juncture with the stationary roof 29, and preferably a rubber gasket will be placed in that joint. The other end of the rear exhaust chamber is formed by means of the inwardly extending flange 50, as shown, supported upon the side walls of the hinged unit. A plurality of bolts such as 51 carried by the end plates 43 and 44 cooperate with inclined slots provided in the fixed chamber to bring about proper registration of the tiltable unit with the affixed chamber.

Ribs such as 40 pivoted on the pintle 52 and secured to the outside sheet 40 of the exhaust chamber support this tiltable unit on the pintle.

In the illustrative example, sulphur dichloride vapor is supplied to the gas chamber from a carburetor 53, whose construction and mode of operation do not constitute a part of this invention. It is sufficient to note that a supply pipe 54 is connected by means of pipe 55 to a manifold 56 supported on the front tiltable unit. A pipe 57 in which a hand operated valve 57' is interposed will supply the gas to the chamber A, while pipe 58, also equipped with a valve 58', supplies the gas to chamber B. The larger chamber C has a pair of gas supply pipes 59 and 60, provided with hand operated valves 59' and 60', respectively. In order to assure uniform distribution of gas in each chamber it is preferred that the pipes 57, 58, 59 and 60 extend longitudinally of their respective chambers and that each be provided with small holes (not shown) facing the drum for directing the gas toward the drum surface. These pipes therefore may conveniently be mounted in the end walls of the respective chambers, and the end of each remote from its valve can be plugged.

Since the manifold 56 moves along with the tiltable front unit the pipe 55 or its connection with the manifold may be a flexible pipe or a series of rigid pipe units connected by flexible joints, as may be preferred.

The gas may be supplied to the rear gas chamber D by means of a supply pipe 61 connected to the manifold 62 from which lead pipes 63, 64 and 65, each of which extend longitudinally of the chamber D and are provided with apertures (not shown) for directing the gas toward the drum surface. Each of these pipes may be individually controlled by valves 63', 64' and 65', respectively.

In the use of the device it is desirable to supply the gas continuously to whichever gas chambers are in use. To prevent the escape of gas into the atmosphere adjoining the machine the gas chambers are surrounded by the exhaust hoods which have been described. These exhaust hoods communicate with a common exhaust pipe 66 which will conduct gas and any air which may be admixed therewith into a scrubber 67 into which sprays of water are injected to absorb as much as possible of the gas. The water may then be drained from the scrubber through pipe 68 and discharged to the sewer or to any other selected place of disposal. A fan 69 may be employed to exhaust air and gas from the scrubber through a pipe 70.

It is preferred that the exhaust chamber on the rear side of the machine have a segregated chamber defined between the longitudinal walls 46 and 50. The purpose of this chamber is to permit a blast of compressed air to be projected against the surface of the decalcomanias or other sheet material undergoing treatment in order to more certainly dislodge gas which may be clinging to the surface of the ink or other material undergoing treatment. The mixture of gas and air thus evolved can then be exhausted from this segregated chamber. Accordingly, I provide a pair of pipes 71 and 72 extending lengthwise of this separate chamber, each pipe being provided with a plurality of small apertures (not shown) for directing the compressed air towards the drum surface. An exhaust pipe 73 will also be connected as shown to this segregated chamber and will lead into the exhaust pipe 66.

In view of the possibility that some of the gas may cling to the surface of the drum even after the decalcomania sheets have been separated from the drum and delivered onto the conveyor belt 18 I further prefer to position a longitudinally extending chamber 74, as shown in Figure 2, adjoining the drum and deliver compressed air through the pipe 75 into that chamber so that a blast of air may sweep the drum clean of any clinging gas. The compressed air used in these operations of course may be supplied from any suitable source at any desired pressure.

It will now be apparent that since the machine is provided with four gas chambers, separately controllable, one may supply gas only to chamber D if a short period of treatment is required. If a longer period of treatment is required gas can be supplied selectively to one or more of the additional chambers A, B or C. The preferred combination would be to use chamber D for the shortest period, C and D for the next longer period, B, C and D for the next longer period and all four for the longest period. In any event as the decalcomanias move from under the last treating chamber D, the treatment of the ink surfaces or other material is sharply terminated by the blast of fresh air projected from the pipes 71 and 72. The exhaust hoods are so arranged that no difficulty should be experienced in preventing the gas from escaping into the air surrounding the machine.

While four treatment chambers of definite size are illustrated in the drawing it will be apparent that more or less gas chambers may be provided and that the dimensions of them along the arc of the drum may likewise be varied. While the drawings show the preferred structural support for the principal parts of the apparatus it is sufficient for the present purposes to know that the drum shaft may be supported in any appropriate manner on the frame, that the hinge pintles for the tiltable chambers may likewise be supported on the frame and that the stationary chamber section above the central part of the drum may be supported on a pair of rods 76 which are suspended on the brackets 77 and 78, shown in Figure 1.

While the treating chambers or compartments A, B, C and D are in contiguous arcuate arrangement, they preferably are not in actual contact with each other, but, as shown, narrow spaces ex-

ist between them which permit the exhaust apparatus to draw air along the drum surface and outwardly through such spaces, thus effectively preventing the treating vapor from progressing along the drum contra to its direction of rotation and collecting in any chamber not at the time being intentionally supplied with vapor.

While it is apparent that the apparatus as shown and described is capable of furnishing treatments of different selected durations to the material passing through the apparatus at a uniform drum speed it should be understood that a variable speed drive of the drum may also be utilized to contribute further flexibility to the use of the apparatus.

While I have shown and described herein, for the sake of illustrating the invention, a preferred embodiment thereof it will be appreciated that the invention is susceptible of considerable change both in structural details and in mode of operation and that such variations are embraced within the scope of the invention, as defined in the appended claims.

I claim as my invention:

1. An apparatus of the class described comprising supporting and conveying means for coated sheet material, a plurality of compartments arranged contiguously to each other consecutively relatively to the direction of travel of the conveying means and each having an open side facing said conveying means and so arranged that sheet material on the conveying means passes the compartments consecutively, each compartment being shallow in depth relatively to its dimension in the direction of travel of the conveying means, means for supplying treating agent to each of said compartments, means for controlling the supply of treating agent individually to each compartment, exhaust means including a fan and an exhaust hood positioned relatively to the margins of the compartments to collect and exhaust treating agents tending to escape to the surrounding atmosphere, and a purge chamber disposed adjoining and beyond the last compartment to which sheets on the conveyor are exposed, said chamber having an open side facing said conveying means, means for directing a blast of air against sheets while exposed to said chamber, and exhaust pipe means for collecting the mixture of air and treating agent accumulating in said chamber bypassing said hood and communicating directly with said exhaust fan.

2. Apparatus of the class described comprising a rotary drum having means for supporting and conveying coated sheet material, a plurality of compartments positioned adjoining the surface of the drum in consecutive arcuate arrangement, each compartment having an open side exposed to the drum surface, each compartment being shallow in depth relatively to its dimension in the direction of travel of the drum, means for supplying treating agent to each of said compartments, means for controlling the supply of treating agents individually to the compartments, whereby sheet material carried at uniform speed on the drum may be optionally subjected to treatment of different durations by selectively supplying treating agents to one or more of the compartments, a plurality of said compartments being pivotally mounted as a unit for rotation away from the drum to make their open sides accessible for inspection and to simultaneously expose a portion of the drum surface.

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