

Sept. 22, 1959

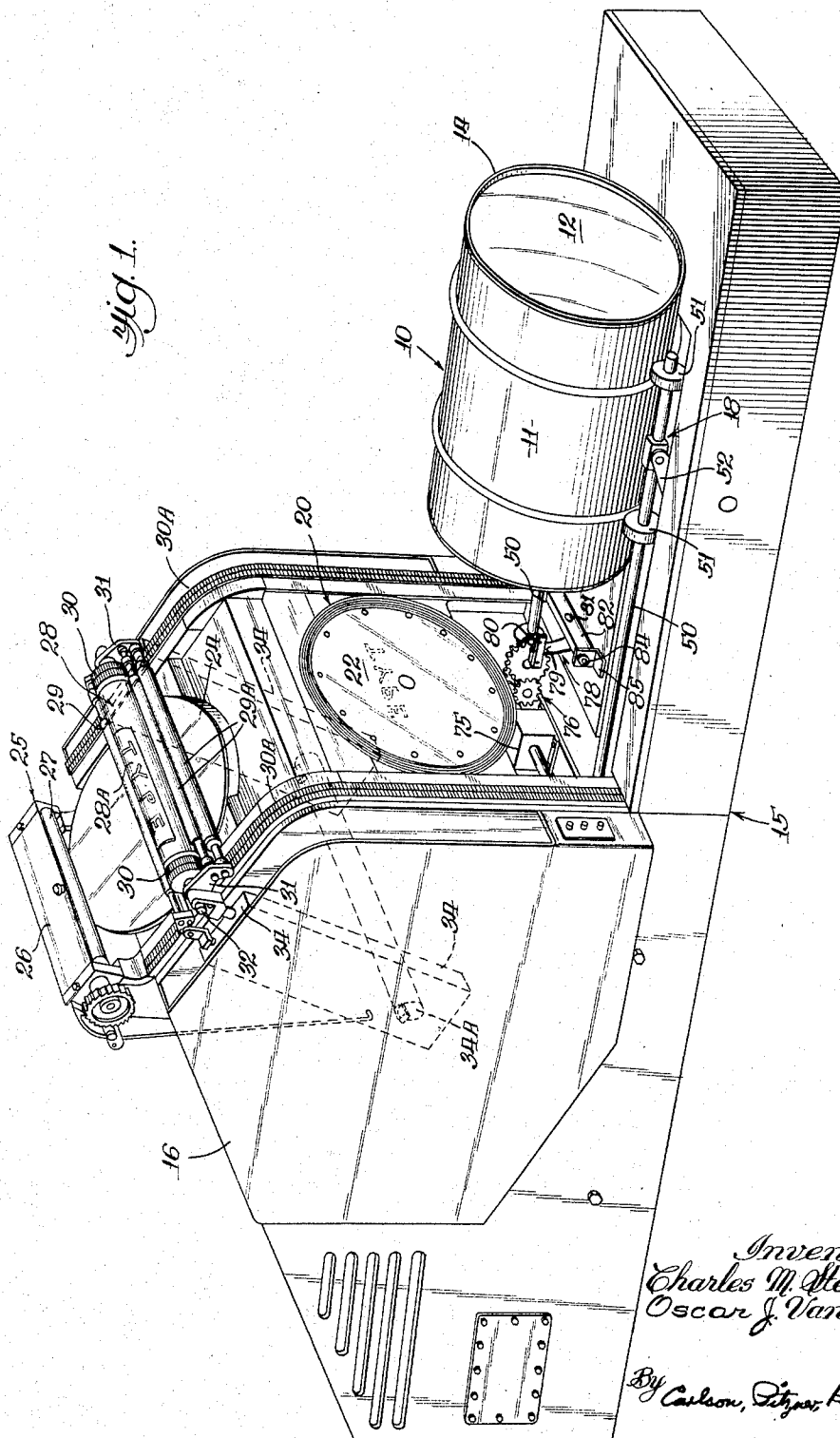
C. M. STEARNS, JR., ET AL

2,905,082

METHOD OF AND MEANS FOR OFFSET PRINTING

Filed Oct. 7, 1954

3 Sheets-Sheet 1



Sept. 22, 1959

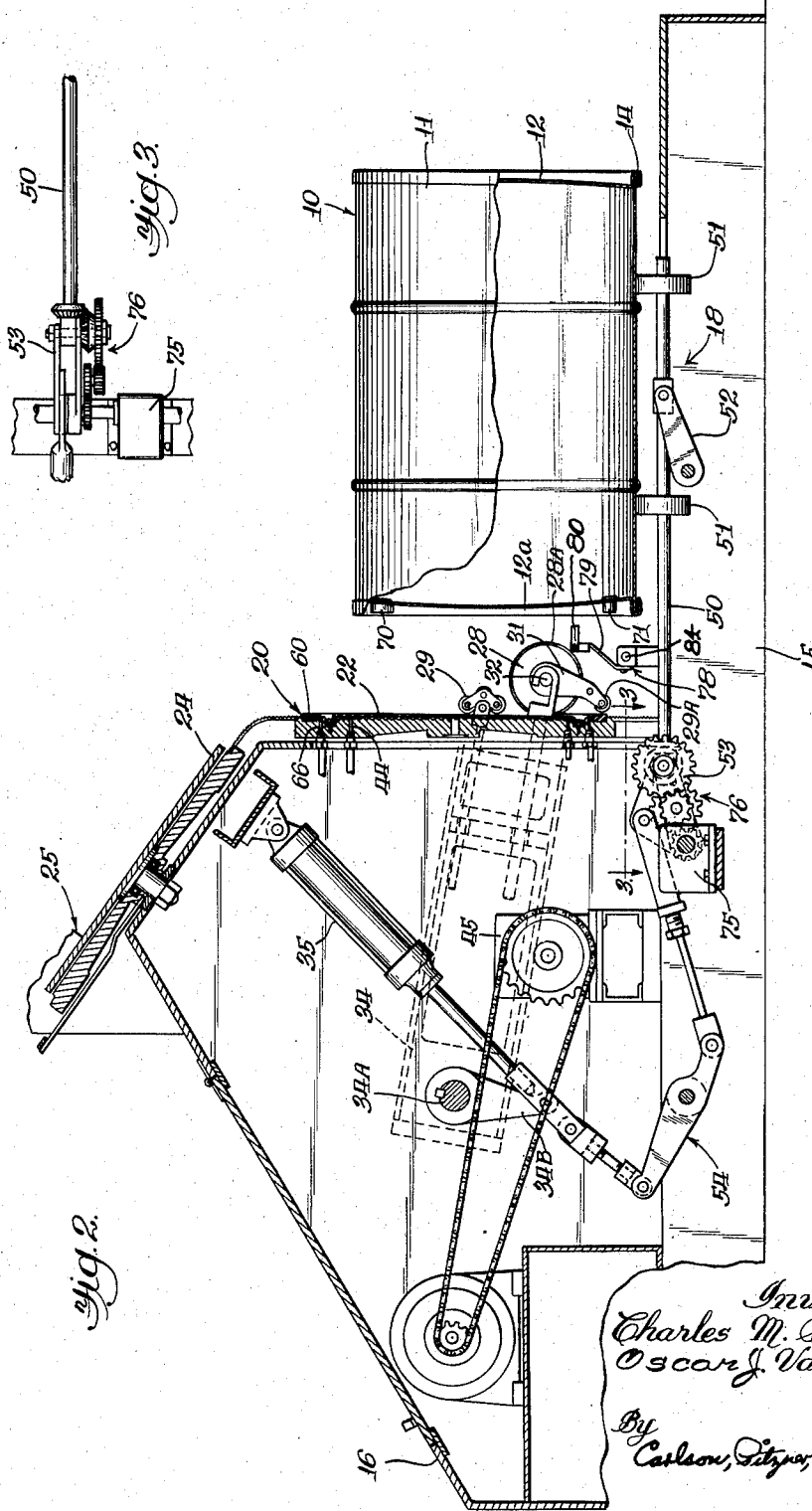
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3 Sheets-Sheet 3

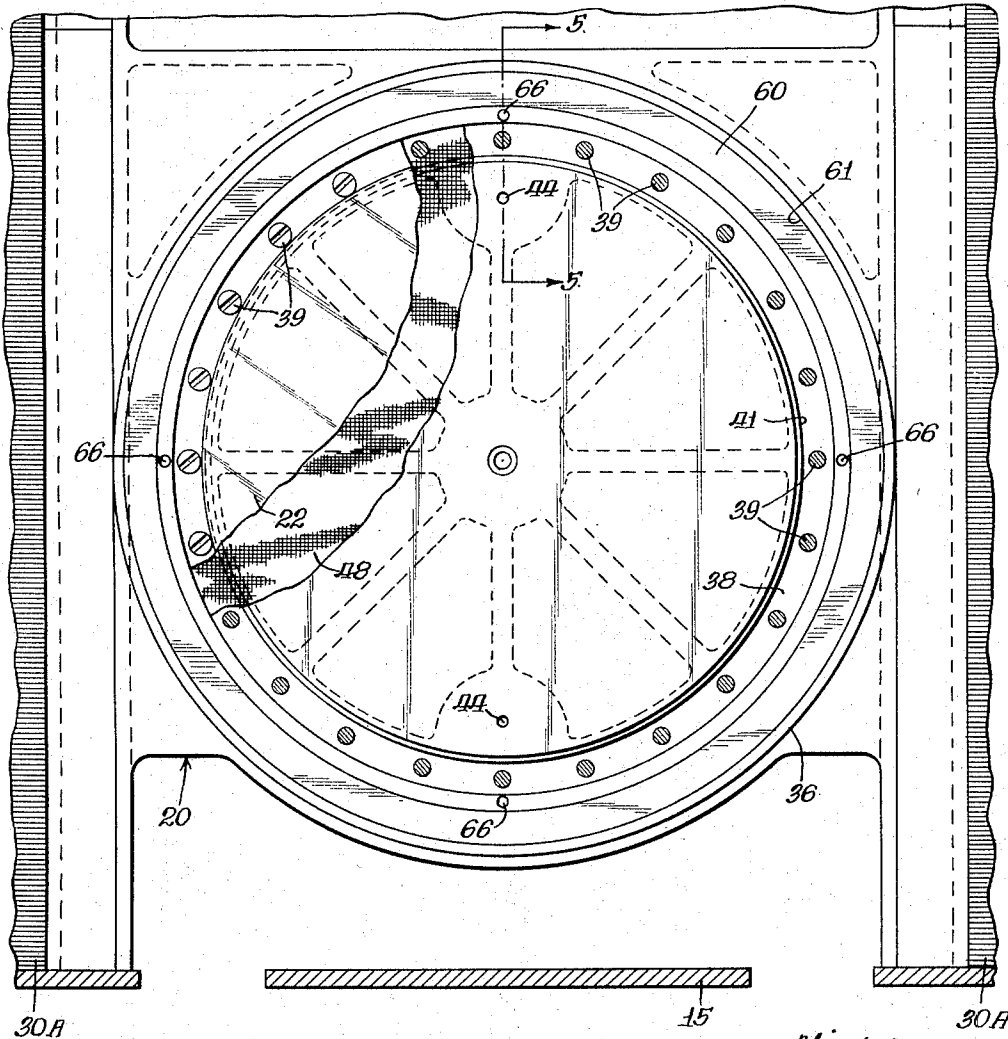


Fig. 4.

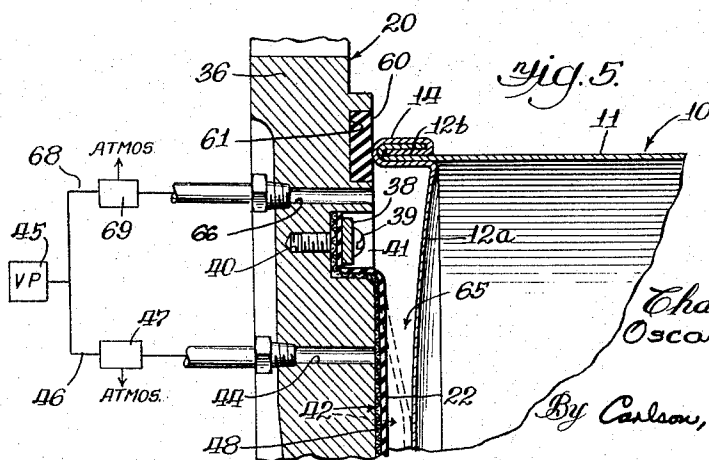


Fig. 5.

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2,905,082

METHOD OF AND MEANS FOR OFFSET PRINTING

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12 Claims. (Cl. 101—41)

The present invention relates generally to printing and more particularly to offset printing on surfaces which may be either of flat or irregular contour. The invention finds particular, though by no means exclusive, utility in the printing of information on such articles, for example, as the ends of steel drums.

In printing of this general character a flexible blanket is commonly employed to which an impression is applied from an inked type roller, and from which the impression is transferred to the surface to be printed. Conventionally the blanket is flattened for the application of the inked impression thereto. Subsequently the blanket is made to conform to the surface to be printed so as to effect the transfer of the impression to that surface. In the printing of large articles, such as a steel drum head, a correspondingly large blanket is required and it has been found difficult to maintain, with presently available equipment, flatness of the blanket during the application of the ink thereto from the type roller. Further, with prior devices for a similar purpose, it has been found exceedingly difficult to completely conform the blanket to an irregular surface to be printed. As a result, an imperfect transfer of the impression from the blanket to the surface to be printed obtains. This difficulty is most frequently caused by the entrapment of air in pockets or layers between the blanket and the surface to be printed.

Because of these difficulties in the particular case of steel drums, it has commonly been the practice to apply indicia to the heads thereof by stenciling. This practice has the obvious disadvantage of consuming a great deal of working time and yet often results in imperfect application of the desired indicia.

It is an object of the present invention to provide an improved offset printing device wherein the maintenance of the printing blanket in flat condition is assured for the application of a true impression thereto from a type roller.

Another object is to provide in such a device a novel construction and arrangement whereby there obtains complete conformity of the blanket to an irregular surface.

Still another object of the invention is to insure substantially complete drying of the impression transferred to the surface to be printed as an incident to completion of the printing operation.

A further object of the invention is to provide an offset printing device whereby manual operations are minimized.

Yet another object is to provide an improved method of offset printing by which the transfer of a perfect impression to a surface is assured, and by which the transferred impression is substantially dry upon completion of the printing operation.

The objects of the invention thus generally set forth together with other objects and ancillary advantages are attained by the construction and arrangement shown by way of illustration in the accompanying drawings, in which:

Figure 1 is a perspective view of a printing machine embodying the features of the present invention.

Fig. 2 is a longitudinal vertical section through the printer shown in Fig. 1.

Fig. 3 is a fragmentary plan view of the drum cradle drive means of the exemplary printer taken substantially in the plane of line 3—3 of Fig. 2.

Fig. 4 is a fragmentary and elevation of the printer shown in Figs. 1 and 2.

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Fig. 5 is a fragmentary sectional view, partly diagrammatic, taken substantially in the plane of line 5—5 in Fig. 4.

While the invention is susceptible of various modifications and alternative constructions, there is shown in the drawings and will herein be described in detail a preferred embodiment. It is to be understood that it is not intended thus to limit the invention to the form disclosed, but that it is intended to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more particularly to the drawings, there is shown for purposes of illustration an offset printing machine for the application of indicia to the ends of steel drums. While the exemplary device is primarily intended for such a purpose, it will be readily appreciated that printing on other irregular surfaces, such as on the body of the drum, for example, can be accomplished with equal facility by employing the teachings of the present invention.

In the drawings there is shown an oil drum 10 which includes a generally cylindrical body 11 closed at its ends by heads 12 which are double seamed to the body. The drum heads 12 have central, transaxially disposed portions 12a of generally convex or dome shape merging with outwardly turned peripheral flange portions 12b (Fig. 5). It is these flange portions 12b that are double seamed with the ends of the drum body 11 forming the chines or outwardly projecting ribs 14. For purposes of illustration the exemplary printing device is designed to print upon the convex central portion 12a of the drum head indicia such, for example, as the maker's name, the drum contents, and the like.

The illustrative device shown in the drawings includes generally a base 15 having a housing 16 disposed at one end thereof and mounting a cradle 18 at the other end. The latter is intended to receive the drum 10 in a horizontal position. In the front face of the housing 16 there is mounted a printing head, generally designated 20, which includes an offset blanket 22. In order for the blanket both to conform to the curvature of the drum head and to lie flat to receive an impression which is to be transferred to the drum head, the blanket is preferably formed of a rubberlike substance which is both flexible and resilient, and which readily permits of cleansing of ink or similar printing substance.

On the upper surface of the housing 16 and disposed in angular relation to the printing head 20 is an inking plate 24 to which ink is applied from a fountain 25. The fountain 25 may be of conventional construction including a reservoir 26 and inking rolls 27, together with means for rotating the latter, in order to withdraw ink from the reservoir.

In order to apply an impression to the printing blanket 22 of the printing head 20, the illustrative device is equipped with a type roller mechanism 28. This mechanism includes a type roller which is adapted to receive rubber-faced type 28A. Spreader rolls 29, 29A receive ink from the fountain inking rolls 27, and uniformly distribute it over the inking plate 24. From the plate 24 the ink is transferred to the face of the type 28A. For this purpose, the type roller 28 is equipped at its ends with suitable pinions 30 which in turn mesh with a pair of racks 30A disposed along the opposite side edges of the housing 16 in such manner as to eliminate backlash.

In order to traverse the type roller mechanism 28 over the inking plate 24 and across the printing head 20, each of the rollers of the mechanism 28 are journaled at their ends in a carrier 31, the latter being equipped with trunnions 32 to which are connected the outer ends of actuator arms 34. As shown, the actuator arms 34

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are pivoted on a transverse shaft 34A within the housing 16. The shaft 34A, and thus the arms 34, is adapted to be rocked by means of a pressure fluid actuator 35 (Fig. 2) connected to the shaft 34A by a crank arm 34B.

In accordance with one aspect of the present invention the printing head is especially constructed and arranged to insure that the printing blanket 22 is maintained flat for the application of an impression thereto from the faces of the type 28A on the mechanism 28. Referring more particularly to Figs. 4 and 5, it will be seen that the printing head 20 includes a ribbed backup plate 36 to which the printing blanket is secured by a retainer ring 38 having spaced openings therethrough for the reception of screws 39 which are engageable in tapped holes 40. As shown, the retainer ring 38 is received in a concentric recess 41 formed in the backup plate 36 so as to be disposed inwardly of the plane of the outer surface of the latter.

With the blanket thus fixed in place on the backup plate there is defined a chamber 42 between the blanket and the front face of the backup plate, which for purposes of simplicity shall be referred to as the blanket chamber. By means of ports 44 provided in the backup plate 36 the blanket chamber 42 is adapted to be connected to a vacuum system including a vacuum pump 45 so as to permit evacuation of the chamber 42. Atmospheric pressure acting on the front surface of the blanket 22 then serves to press it toward the flat front face of the backup plate 36. This connection may be effected by means of suitable piping diagrammatically indicated at 46 including a valve 47. The valve 47 is preferably of the solenoid actuated type and is constructed and arranged to alternatively establish communication between the ports 44 and the pump 45 and between the ports 44 and the atmosphere.

To insure that the blanket is held flat and that no air pockets or layers are formed between the blanket and the backup plate, means is provided for maintaining a space between the rear side of the blanket 22 and the front face of the backup plate 36 at all times, to the end that the vacuum acts uniformly over the entire rear surface of the blanket 22. At the same time sufficient rigidity is provided for supporting the flattened blanket. In the illustrative embodiment, this means comprises a layer of screen mesh 48, preferably of fine gauge so as to minimize the effect of its own surface irregularities. That is to say, since screen mesh commonly comprises a fabric of woven wire strands, the strands at their cross-over points cause the mesh to be of somewhat greater thickness than the interstices. These portions of greater thickness if spaced far enough apart would cause corresponding irregularities in the outer surface of the blanket when it is drawn against the screen upon evacuation of the chamber 42. In such case the "high points" would become inked and the intervening portions be left uninked so that an imperfect, mottled impression would result. This is avoided by the use of a fine mesh screen layer. As a matter of practice it has been found desirable that the screen comprise so-called wire gauze of approximately 120 mesh.

It will be apparent that the inclusion in the blanket chamber 42 of the mesh 48 insures the maintenance of a space between the blanket 22 and the backup plate 26, the interstices along the strands of the mesh providing intercommunication whereby the vacuum system can completely evacuate the entire chamber 42. Thus atmospheric pressure acting on the front face of the blanket 22 causes the blanket to be held throughout its area in flat condition. Accordingly there is substantially no deformation of the blanket 22 as the type roller 28 traverses it. A true impression is applied to the blanket from the faces of the type 28A on the type roller.

After an impression has been applied to the front surface of the blanket 22, the cradle is operated so as to bring the drum head 12 into juxtaposition with the printing head 20. The cradle 18 includes a pair of longitudinally disposed arms 50 equipped with rollers 51 for

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supporting the drum 10. The arms 50 are each supported by a pair of spaced arms 52 and 53 which are pivoted on the base 15. One of the arms 53 (Fig. 2) is of bell-crank form and by a suitable operating linkage, indicated generally at 54 is connected with the hydraulic actuator 35. Thus, upon operation of the actuator 35 the arms 53, 52, and 50 are rocked so as to move the drum 10 from the position shown in Figs. 1 and 2 toward the position shown in Fig. 5, placing the head 12 opposite the blanket 22. It will be seen that the interrelated operative connection between the actuator 35, the roller assembly 28 and the cradle 18 coordinates movement of the latter two, to the end that the cradle is retracted when the printing roller assembly traverses the printing head 20. Conversely the printing roller assembly is moved from the printing head 20 and traverses the printing plate 24 when the cradle is moved toward the printing head.

As hereinbefore noted, with previously available devices for printing on irregular surfaces, considerable difficulty has been experienced in attaining complete conformity of the offset blanket with the surface to be printed because of "air layering" or the formation of air pockets between the blanket and the surface to be printed. In accordance with another important aspect of the present invention there is provided an improved method of offset printing and means for practicing the method whereby the formation of any such air layers or pockets is prevented. Faithful conformity and engagement of the blanket with the surface to be printed results to transfer a perfect impression. This is accomplished by evacuating the space between the blanket and the surface to be printed prior to causing the blanket to conform to such surface. Thus, when the blanket is caused to move toward and to conform to the surface to be printed, it is moved into an already evacuated space.

In carrying out this aspect of the invention a chamber is formed which is defined in part by the surface to be printed and the forward surface of the offset blanket. The chamber is adapted to be evacuated while the offset blanket is maintained in flat condition. While maintaining this chamber evacuated the blanket is expanded into it and thus into engagement with the surface to be printed. Air having been removed from the chamber prior to expansion of the blanket complete conformity of the blanket with the surface to be printed is assured.

As shown in Figs. 2, 4 and 5, the backup plate 36 is equipped with sealing means such as a resilient gasket or sealing ring 60 which is disposed in an annular groove formed in the backup plate 36 adjacent its periphery and concentrically surrounding the blanket retainer ring recess 41. The sealing ring 60 is adapted for engagement by the double-seamed rim portion 14 of the drum 10 when the latter is moved into juxtaposition with the printing head 20 upon movement of the cradle 18. Upon engagement of the rim 14 with the sealing ring 60 a chamber 65 (Fig. 5), which for convenience will be referred to as the drum head chamber, is formed. This chamber is defined by the drum head 12, the double seam or rim 14 of the drum 10, the sealing ring 60, the backup plate 36 and the front face of the offset printing blanket 22.

In order to evacuate the drum head chamber 65 communication between it and the vacuum pump 45 is provided. For this purpose the backup plate is provided with suitable ports 66 which as shown open into the drum head chamber 65 between the sealing ring recess 61 and the blanket retainer ring recess 41. The drum head chamber ports 66 are adapted to be connected to the vacuum pump 45 by means of suitable pipe indicated generally at 68 and including a valve 69. The valve 69 is diagrammatically indicated in Fig. 5 and like the valve 47 can be of the solenoid operated type constructed and arranged to alternatively connect the ports 66 to the vacuum pump 45 and to the atmosphere.

It will be appreciated that since the drum head cham-

ber 65 is to be evacuated it is only necessary that the drum 10 be moved so that its rim 14 engages the sealing ring 60. It is unnecessary that any special provision be made for holding the drum 10 in intimate engagement with the sealing ring 60 since this is accomplished by the action of atmospheric pressure on the drum.

With the evacuation of the drum chamber 65 it will be appreciated that no air pockets or layers between the drum head 12 and the offset blanket 22 can be formed. As a result the offset blanket, when expanded, will conform completely to the surface of the drum head regardless of its condition whether flat or domed, smooth or dented. As a result the transfer of a complete and true impression from the blanket to the surface of the drum head is effected.

In order to expand the blanket 22 into engagement with the drum head 12 atmospheric pressure is admitted to the blanket chamber 42. For this purpose the valve 47 is operated to interrupt communication between the ports 44 and the vacuum pump 45 and to establish communication between the ports 44 and the atmosphere. Since the drum head chamber 65 is evacuated atmospheric pressure in the blanket chamber 42 causes the blanket 22 to expand into the drum head chamber 65 and into intimate engagement with the drum head 12 so as to transfer an impression, originally applied to the blanket from the type 28A, to the drum head.

It will be appreciated that in printing on a surface such as that of a drum head there is substantially no absorption by the surface of the fluid or vehicle of the ink. Thus, evaporation of the ink's vehicle is necessary. Heretofore considerable difficulty has been experienced with smearing of the impression transferred or otherwise applied to such surfaces because of the length of time required by the ink to dry. In accordance with another aspect of the invention, provision is made whereby the impression transferred to the drum head is substantially dry upon completion of the printing operation, i.e., the removal of the drum 10 from engagement with the printing head 20. In the present instance this is accomplished by maintaining the drum head chamber 65 in evacuated condition for a short interval of time to increase the rate of evaporation of the vehicle of the ink of which the impression is formed. With the instant printing device this is accomplished in the following manner. After the valve 47 has been opened to the atmosphere so as to expand the blanket 22 into engagement with the drum head 12, the valve 47 is then operated to reconnect the blanket chamber 42 to the vacuum pump 45 so as to again evacuate the blanket chamber. The valve 69 has remained in its position connecting the drum head chamber 65 with the vacuum pump 45 so as to maintain the drum head chamber evacuated. When the pressure in the blanket chamber 42 is reduced to substantially equal that in the drum head chamber 65 the inherent resilience of the material of the blanket 22 causes it to return to its normal flat condition, thus pulling itself out of engagement with the drum head 12. Maintenance of the vacuum in the blanket chamber 42 results in firmly flattening the blanket against the screen mesh layer 48, thus insuring complete disengagement of the blanket from the drum head. As a result, the entire surface of the drum head 12 and the inked impression which has been applied thereto is exposed to the influence of the vacuum in the drum head chamber 65. Thus, the vehicle of the ink forming the impression on the drum head 12 is rapidly evaporated and the impression is quickly dried. The length of the interval of time necessary for the drying of the impression is of course dependent upon the drying characteristics of the ink employed. In practice with one kind of ink it was found that complete drying of the ink was achieved in a matter of a few seconds under these conditions, whereas an impression formed of the same ink could still be smeared after

drying overnight when exposed to ordinary atmospheric drying.

After the passage of the requisite drying interval the valve 69 is operated so as to interrupt communication between the drum head chamber 65 and the vacuum pump 45 and to connect the former to the atmosphere. This releases the drum 10 from engagement with the printing head 20. Thereafter the actuator 35 is operated to move the cradle into its retracted position, as shown in Figs. 1 and 2, where the drum can be discharged and a succeeding drum loaded onto the cradle. Simultaneously with this movement, the printing roller assembly 28 traverses the inking plate 24 and the printing head 20 to renew the impression on the blanket 22.

Steel drums of the type illustrated are conventionally provided with one end which is equipped with bungs. Ordinarily two bungs are provided, one large and one small. These are indicated respectively at 70 and 71 in Fig. 2 of the drawings. More particularly each bung includes an annular internally threaded collar which is made rigid with the drum head 12 and which receives an appropriately sized, externally threaded plug. The bungs 70 and 71 are spaced inwardly from the double seam or rim 14 of the drum.

In order to make use of the entire diameter of the drum head 12 for printing purposes, as well as for the sake of uniformity of appearance, it is desirable that the lines of the printed impression be arranged transversely of a line determined by the two bungs. As a result it is desirable that the drum 10 be so oriented that the line determined by the two bungs be substantially vertical when the drum 10 is on the cradle and in position for the transfer of an impression from the printing blanket 22 to the drum head 12. In certain installations the drum may be delivered to the printer already in this desired position. However, the illustrative printer is constructed and arranged to properly orient a drum delivered to it in any position. For this purpose means is provided in the illustrative device for rotatably indexing the drum on the cradle 18. As here shown, the cradle arms 50 with the drum supporting rollers 51 carried thereby are journaled for rotation in bearings carried by the arms 52 and 53 and means is provided for rotating the arms 50 and rollers 51 so as to orient the drum 10 into the desired position.

Referring particularly to Figs. 2 and 3 it will be there seen that the illustrative printing machine is equipped with a motor 75 to drive a suitable speed reduction gear train 76 for rotating the arms 50. The rollers 51, therefore, impart rotation to the drum 10. In order to achieve the desired orientation of the drum prior to engagement with the printing head 20, a limit switch operator 78 is provided. The limit switch operator includes a member 79, disposed for engagement by the drum 10 in its movement toward the printing head 20, and equipped with an outwardly projecting finger or feeler 80. The feeler 80 is disposed for engagement by the large bung but not the small bung during rotation of the drum on the cradle 18. The member 79 is supported for pivotal movement about a longitudinal axis defined by a pivot pin 81 for lateral rocking movement. The pivot pin 81 is supported in a transverse member 82 which is journaled for rotation about a transverse axis at 84 between a pair of brackets 85. By an arrangement of switches disposed for operation as a result of movement of the member 79 the following sequence of operation is achieved:

Upon movement of the cradle 18 by the operation of the actuator 35 so as to move the drum toward the printing head 20 the drum is brought into engagement with the member 79 and initiates movement of the member 79 about the axis 84. This initial movement is utilized to operate a limit switch (not shown) operative to interrupt further movement of the cradle and drum toward the printing head and at the same time to initiate

operation of the motor 75 so as to rotate the cradle arms 50 and rollers 51 to rotate the drum. As previously noted the switch operator 78 is so fashioned as to locate the feeler 80 along the path of movement, during rotation of the drum 10, of the bungs 70 and 71 in the drum head 12. Further, the feeler 80 is dimensioned and disposed to permit passage of the small bung 71 thereby but to be engaged by the large bung 70. Upon engagement of the large bung 70 with the feeler 80 of member 79, the member 79 is rocked laterally about the longitudinal axis defined by the pivot pin 81. A limit switch (not shown) is arranged for actuation as a result of such lateral movement and operatively connected so as to interrupt the operation of the motor 75. Rotation of the cradle arms 50, rollers 51 and drum 10 is thus terminated. Simultaneously, the actuator 35 is again operated so as to continue forward movement of the cradle and the drum to bring the drum into engagement with the printing head 20. During such movement the drum 10 moves the member 79 about its axis 84 (in a counterclockwise direction as shown) into an out-of-the-way position. It will be apparent that movement of the switch operator 78 about the axes 81 and 84 is effected against the action of suitable biasing means which normally tend to maintain the actuator in the position illustrated in Figs. 1 and 2. Thus, when a printing operation has been completed and the cradle with the drum thereon is retracted the position of the switch operator 78 as shown in Figs. 1 and 2 is reassumed. The operator is again in position for controlling the orientation of a succeeding drum.

While the operation of the instant offset printing machine will be apparent from the foregoing description it may be summarized briefly as follows: After the desired information is set up in the type 28A on the type roller mechanism 28 the valve 47 is operated to connect the blanket chamber 42 to the vacuum pump 45. The blanket 22 is thus held flat against the screen 42. Thereafter the actuator 35 is operated to traverse the type roller mechanism 28 over the blanket 22 so as to apply thereto the ink impression from the faces of the type 28A. Upon retraction of the type roller mechanism 28 the cradle 18 with a drum 10 in place thereon is started to be moved toward the printing head 20. This movement continues until the drum 10 engages the limit switch actuator 78 and moves it in a counterclockwise direction about the axis 84. In response, the movement of the drum 10 toward the printing head 20 is interrupted, and rotation of the drum 10 is initiated by the motor 75. When the bungs are properly oriented as determined by engagement of the large bung 70 with the actuator 78, the actuator is moved so as to operate limit switches which de-energize the motor 75 and stop rotation of the drum. At the same time, the actuator 35 is re-energized to move the cradle 18 and the drum 10 toward and into engagement with the printing head 20. A suitable limit switch (not shown) can be provided to stop this movement when such engagement between the drum and the printing head obtains.

Upon engagement of the rim 14 of the drum with the sealing ring 60 of the printing head 20 the drum head chamber 65 is formed. Thereafter, the valve 69 is operated to connect the drum head chamber 65 to the vacuum pump 45. When the drum head chamber is evacuated, the valve 47 is operated to interrupt connection of the blanket chamber 42 with the vacuum pump 45 and to open the blanket chamber 42 to the atmosphere. The resulting atmospheric pressure in the blanket chamber expands the blanket 22 into the evacuated drum chamber 65 and into engagement with the drum head 12, thereby transferring the ink impression from the blanket 22 to the drum head.

With the valve 69 still in position connecting the drum head chamber with the vacuum pump 45, the valve 47 is operated to reconnect the blanket chamber 42 to the

vacuum pump 45. When the pressure in the vacuum chamber is sufficiently reduced the blanket 22 will pull away from the drum head 12 leaving the inked impression on the drum head exposed in the drum head chamber 65. The drum head chamber 65 is allowed to remain in an evacuated condition for a predetermined interval of time to permit evaporation of the vehicle of the ink of which the impression on the drum head is formed. It will be apparent to those skilled in the art that this time interval can readily be determined by the incorporation in the electrical control circuit of the device of a suitable timing mechanism.

After the drying time interval has passed, the valve 69 is operated so as to interrupt communication between the drum head chamber 65 and the vacuum pump 45 and to establish communication between the drum head chamber 65 and the atmosphere, thus releasing the drum from sealing engagement with the printing head 20. At the same time operation of the actuator 35 is effected to retract the cradle 18 and withdraw the drum 10. This retracting movement continues until the cradle 18 reaches the position shown in Figs. 1 and 2 wherein the printed drum is discharged and a succeeding drum loaded onto the cradle. Simultaneously with the retracting movement the type roller mechanism is moved across the inking plate 24, to re-ink the faces of the type 28A and then is traversed across the blanket 22 to renew the inked impression thereon for application to the succeeding drum. While the illustrative embodiment of the printing device has been shown to include a type and inking mechanism for applying an inked impression in a single color to the blanket 22, it will be appreciated, of course, that through the provision of an additional inking mechanism including fountain, inking plate, spreader and applicator rolls, properly disposed with respect to the type roller, printing in more than one color can be readily effected.

From the foregoing it will be apparent that the instant invention provides an improved method of printing irregular and non-planar surfaces such as the heads of steel drums, together with means for practicing the method. The transfer of a true impression from type faces to an offset blanket is assured by holding the latter flat during such transfer. Complete conformity of the blanket to the surface which is to be printed, regardless of irregularities therein, and complete drying of the impression transferred to the surface printed upon completion of the printing operation is also obtained.

We claim as our invention:

1. The method of offset printing on roughened or indented surfaces utilizing a flexible blanket comprising the steps of forming a first closed chamber with one side of said blanket constituting one wall of the chamber, evacuating said chamber so as to apply a vacuum to said one side of the blanket, applying an ink impression to the other side of the blanket, forming a printing chamber with the surface to which the impression is to be transferred and the inked side of the blanket included in the chamber in juxtaposition and spaced from each other, evacuating said printing chamber while maintaining said first chamber evacuated so as to apply a vacuum on both sides of the blanket and so as to maintain the blanket out of contact with said surface, then admitting pressure greater than the vacuum pressure in said printing chamber to said first chamber while maintaining the printing chamber evacuated causing a pressure differential on the opposite sides of the blanket which expands the blanket into the printing chamber and forces the same to engage the surface so as to transfer the impression.

2. The method of offset printing on roughened or indented surfaces utilizing a flexible blanket stretched flat in an initial position comprising the steps of forming a first closed chamber with one side of said blanket constituting one wall of the chamber, evacuating said chamber so as to apply a vacuum to said one side of the blanket, apply-

ing an ink impression to the other side of the blanket, forming a printing chamber with the surface to which the impression is to be transferred and the blanket included in the chamber and spaced from each other with the blanket in its initial position, evacuating said printing chamber while maintaining said first chamber evacuated so as to apply a vacuum on both sides of the blanket and so as to maintain the blanket out of contact with said surface, then releasing the vacuum on said one side of the blanket while maintaining the printing chamber evacuated causing a pressure differential on the opposite sides of the blanket which expands the blanket from its initial position into the printing chamber and forces the same to engage the surface so as to transfer the impression, and thereafter evacuating said first chamber while maintaining said printing chamber evacuated so as to apply a vacuum on both sides of the blanket so that the blanket is withdrawn from said surface by its own resilience to its initial position.

3. The method of offset printing on roughened or indented surfaces utilizing a flexible blanket stretched in an initial position over a frame, comprising the steps of forming a first closed chamber including said frame with one side of said blanket constituting one wall of the chamber, evacuating said chamber so as to flatten said blanket against the frame, applying an impression to the other side of said flattened blanket, placing the surface to which the impression is to be transferred in juxtaposition with said other side of said blanket and out of engagement therewith, forming a printing chamber including the other side of said blanket and said surface, evacuating said printing chamber while maintaining said first chamber evacuated so as to maintain the blanket out of contact with said surface, then admitting pressure greater than the vacuum pressure in said printing chamber to said first chamber causing a pressure differential on the opposite sides of the blanket which expands said blanket into said printing chamber and forces the same to engage the surface so as to transfer the impression, and thereafter evacuating said first chamber while maintaining said printing chamber evacuated so as to apply a vacuum on both sides of the blanket so that the blanket is withdrawn from said surface by its own resilience to its initial stretched position.

4. The method of offset printing on roughened or indented surfaces utilizing a flexible blanket comprising the steps of forming a first closed chamber with one side of said blanket constituting one wall of the chamber, evacuating said chamber so as to apply a vacuum to said one side of the blanket, applying an ink impression to the other side of the blanket, forming a printing chamber with the surface to which the impression is to be transferred and the inked side of the blanket included in the chamber in juxtaposition and spaced from each other, evacuating said printing chamber while maintaining said first chamber evacuated so as to apply a vacuum on both sides of the blanket and so as to maintain the blanket out of contact with said surface, then admitting pressure greater than the vacuum pressure in said printing chamber to said first chamber while maintaining the printing chamber evacuated causing a pressure differential on the opposite sides of the blanket which expands the blanket into the printing chamber and forces the same to engage the surface so as to transfer the impression, withdrawing the blanket from said surface while maintaining said printing chamber evacuated, and thereafter maintaining the printing chamber evacuated for a predetermined time interval so that the evacuated atmosphere over the printed impression facilitates the drying of the ink.

5. In an offset printing device for printing on roughened or indented surfaces such as oil drum heads, the combination comprising a frame, a printing head including a resilient blanket stretched flat in an ink impression receiving position on said frame, means for supporting a drum in a printing position with the head thereof

facing the stretched blanket, means defining a confined space behind said blanket and including the frame, means for applying vacuum to the space behind the blanket for maintaining the blanket stretched flat on said frame while the ink impression is applied to the blanket, means carried by the printing head for forming a printing chamber including said blanket with the impression thereon and the drum head, means for applying vacuum to said printing chamber while maintaining the application of vacuum to the space behind the blanket, means for releasing the vacuum in the space behind the blanket while maintaining the vacuum in the printing chamber causing a pressure differential on the opposite sides of the blanket which expands the blanket into the evacuated printing chamber to engage the drum head to transfer the impression thereto, and means for applying vacuum to the space behind the blanket while continuing the application of vacuum to the printing chamber for withdrawing the blanket by its own resilience to the original flat position, the evacuated atmosphere in the printing chamber and over the printed impression facilitating the drying of the ink.

6. In an offset printing device for printing on roughened or indented surfaces such as oil drum heads, the combination comprising a frame, a type roller and means for inking said roller on said frame, a printing head including a backing plate mounted on said frame, a resilient blanket stretched in an initial position on said plate, a cradle for carrying a drum from a loading position to a printing position facing the stretched blanket, a fine mesh screen between said blanket and said backing plate defining a space behind said stretched blanket and supporting said blanket flat for receiving an ink impression from the type roller, a resilient member carried by the backing plate and adapted to sealingly engage the drum when held by the cradle in a printing position for forming a printing chamber including the blanket and the drum head, means for evacuating the space behind the blanket, means for evacuating the printing chamber while the vacuum is maintained in said space, means for releasing the vacuum in the space behind the blanket causing a pressure differential on the opposite sides of the blanket which expands the blanket into the evacuated printing chamber to engage the drum head to transfer the impression thereto, and means for applying vacuum to the space behind the blanket while maintaining the printing chamber evacuated so that the blanket is withdrawn from the surface by its own resilience to the initial flat position.

7. In an offset printing device for printing on roughened or indented surfaces such as oil drum heads, and having means for supporting a drum in position to be printed, a printing head comprising, in combination, a backing plate mounted so as to be facing the drum head, a resilient blanket to which an ink impression is applied for transfer to the drum head, said blanket being peripherally secured to said backing plate, an annular resilient member supported on the backing plate around the periphery of the blanket and adapted to engage the rim of the drum to form a printing chamber including the blanket and the drum head, means for supporting said blanket flat and spaced from the backing plate, means for evacuating the space between said blanket and said backing plate to draw said blanket flat against the latter means for the application of the ink impression thereto, means for evacuating the printing chamber, and means for selectively operating said means for evacuating the space and the printing chamber and releasing the vacuum therein so that both the space and the chamber are first evacuated and the blanket is held from engagement with the drum head and then the blanket is caused to expand due to release of vacuum pressure in said space, to engage the drum to transfer the impression thereto.

8. In an offset printing device for printing on rough-

ened or indented surfaces such as oil drum heads, the combination comprising a frame, a type roller and means for inking said roller on said frame, a printing head including a backing plate mounted upright on said frame, a cradle for carrying a drum from a loading position to a horizontal printing position against said backing plate, a resilient blanket to which an ink impression from the type roller is applied for transfer to the drum head, said blanket being peripherally secured to said backing plate, an annular resilient sealing member on the backing plate surrounding the blanket and positioned to sealingly engage the rim of the drum to form a printing chamber closed by the backing plate, means for supporting said blanket flat and spaced from the backing plate, said backing plate having ports opening under the blanket to the space between the blanket and the backing plate, and other ports beyond the periphery of the blanket within the sealing member to the printing chamber, means for applying vacuum through said ports under the blanket to said space so that the blanket is first drawn flat against the support means for the application of the ink impression thereto, means for applying vacuum through the other ports to the chamber while maintaining the vacuum in said space so that the blanket is held from engagement with the drum head, and means for releasing the vacuum applied through the ports under the blanket causing a pressure differential on the opposite side of the blanket which expands the blanket into the evacuated printing chamber to engage the drum head to transfer the impression thereto.

9. In an offset printing device for printing on roughened or indented surfaces such as oil drum heads and having means for supporting a drum in position to be printed, a printing head comprising, in combination, a backing plate mounted so as to be facing the drum head, a resilient blanket to which an ink impression is applied for transfer to the drum head, said blanket having a diameter less than the drum diameter and being peripherally secured to said backing plate, an annular resilient member on the backing plate surrounding the blanket and adapted to sealingly engage the rim of the drum to form a printing chamber closed by the backing plate, means for spacing said blanket from said backing plate for supporting said blanket flat, said latter means being pervious to air, means for applying vacuum to the space between said blanket and said backing plate to draw said blanket flat against said support means for the application of the ink impression thereto, means for applying vacuum to said printing chamber while maintaining the vacuum in said space so that the blanket is held from engagement with the drum head to be printed, and means for releasing the vacuum in said space causing a pressure differential on the opposite sides of the blanket which causes the blanket to expand into the printing chamber to engage the drum head to transfer the impression thereto.

10. In an offset printing device for printing on roughened or indented surfaces such as oil drum heads and having a frame, a cradle on said frame for supporting a drum in a horizontal printing position, a printing head on the frame comprising an upright backing plate mounted facing the drum head, a fine mesh screen on said backing plate, a resilient blanket to which an ink impression is applied for transfer to the drum head, said blanket being peripherally secured to said backing plate and stretched flat over said fine mesh screen, a sealing member on the backing plate and adapted to engage the drum head to form a printing chamber closed by the backing plate, said resilient blanket being supported in said printing chamber, said backing plate having ports opening under the blanket to the space defined by the screen and other ports beyond the periphery of the blanket within the sealing member to the printing chamber, means for applying vacuum through the ports under the blanket to the space formed by the screen so that the blanket is drawn flat against the screen for the application of an ink

impression thereto, means for applying vacuum to the printing chamber through the other ports while maintaining said space evacuated so that the blanket is held from engagement with the drum head to be printed by maintaining the said vacuum while vacuum is applied to the chamber, means for releasing the vacuum in said space causing a pressure differential on the opposite sides of the blanket which expands the blanket into the evacuated printing chamber to engage the drum head to transfer the impression thereto, and means for applying vacuum to said space while maintaining said printing chamber evacuated so that the blanket is withdrawn from engagement with the drum head by its own resilience, the vacuum in the printing chamber facilitating drying of the ink forming the printed impression.

11. In an offset printing device for printing on roughened or indented surfaces such as oil drum heads, the combination comprising a frame, a printing head including a vertical backing plate mounted on said frame, a resilient blanket to which an ink impression is applied for transfer to the drum head, means for supporting said blanket on the face of said plate, a cradle for carrying a drum from a loading position to a printing position wherein the axis of the drum is normal to the blanket and the drum head is adjacent the latter, said cradle including roller means under the drum so that the latter may be turned to register the drum head relative to the ink impression on the blanket, and means for moving said blanket away from said backing plate into contact with the drum head to transfer the ink impression on the blanket to said drum head.

12. In an offset printing device for printing on roughened or indented surfaces such as oil drum heads of the type having a small bung and a large bung extending from opposite sides of the drum head, the combination comprising a frame, a type roller and means for inking said roller on said frame, a printing head including a vertical backing plate mounted on said frame, a resilient blanket stretched flat over said backing plate to receive an ink impression from said type roller, a cradle for carrying a drum from a loading position to a printing position wherein the axis of the drum is normal to the stretched blanket and the drum head is adjacent the latter, said cradle having means for rotating the drum about its axis, means including a feeler positionable adjacent said drum head at a location to permit passage of the small bung but for engagement by the large bung upon such rotation of said drum, means operated by said feeler controlling the rotation of said drum to register the drum head relative to the ink impression on the blanket such that the ink impression when transferred is applied to the area of the drum head between the bungs, a member carried by the backing plate and adapted to be sealingly engaged by the drum head when the drum is held by the cradle in said printing position for forming a printing chamber including the blanket with an impression thereon and the drum head, and means connected to said printing chamber and said backing plate for applying a differential pressure on the opposite sides of said blanket so as to move said blanket away from said backing plate into contact with the drum head to transfer the impression on the blanket.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,905,082

September 22, 1959

Charles M. Stearns, Jr., et al

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 12, line 66, list of References Cited, under UNITED STATES PATENTS, second item thereof, for "1,124,711" read -- 2,124,711 --.

Signed and sealed this 12th day of April 1960.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

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Commissioner of Patents