# United States Patent

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[33] **France**
[31] **58,616**


[54] **APPARATUS FOR AUTOMATICALLY PRINTING TWO FACES OF AN OBJECT**
**5 Claims, 4 Drawing Figs.**


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[51] **Int. Cl.** ..... **B41f 17/18,** B41l 13/12, B65g 47/52
[50] **Field of Search** ..... 101/38, 38(A), 39, 40, 35, 114, 115, 123, 126, 124; 214/1(B)5, 1(B)52, 1(B)53, 1(B)54, 1(B)4; 198/27



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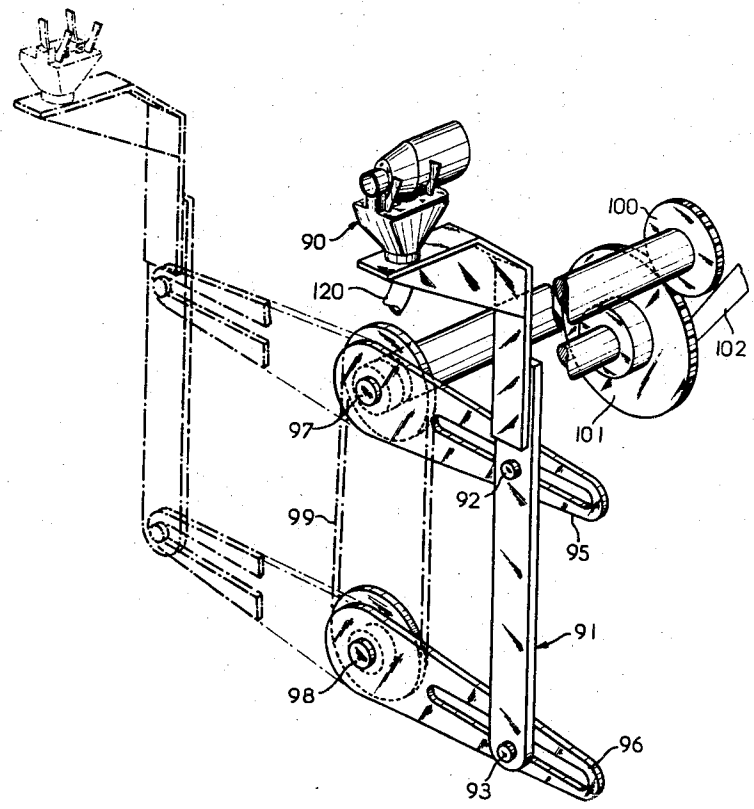
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**ABSTRACT:** A machine for printing two surfaces of an object of oval cross section comprises two printing stations at each of which a rotary device presents the object to a printing means in such a way that the surface to be printed rolls without sliding in contact with the printing device. The objects are transferred from one printing station to the other by means of a transfer fork carried at the end of a lever forming one side of a parallel lever system such that movement of the fork is tangential to the path of travel of a body in one of the rotary means.

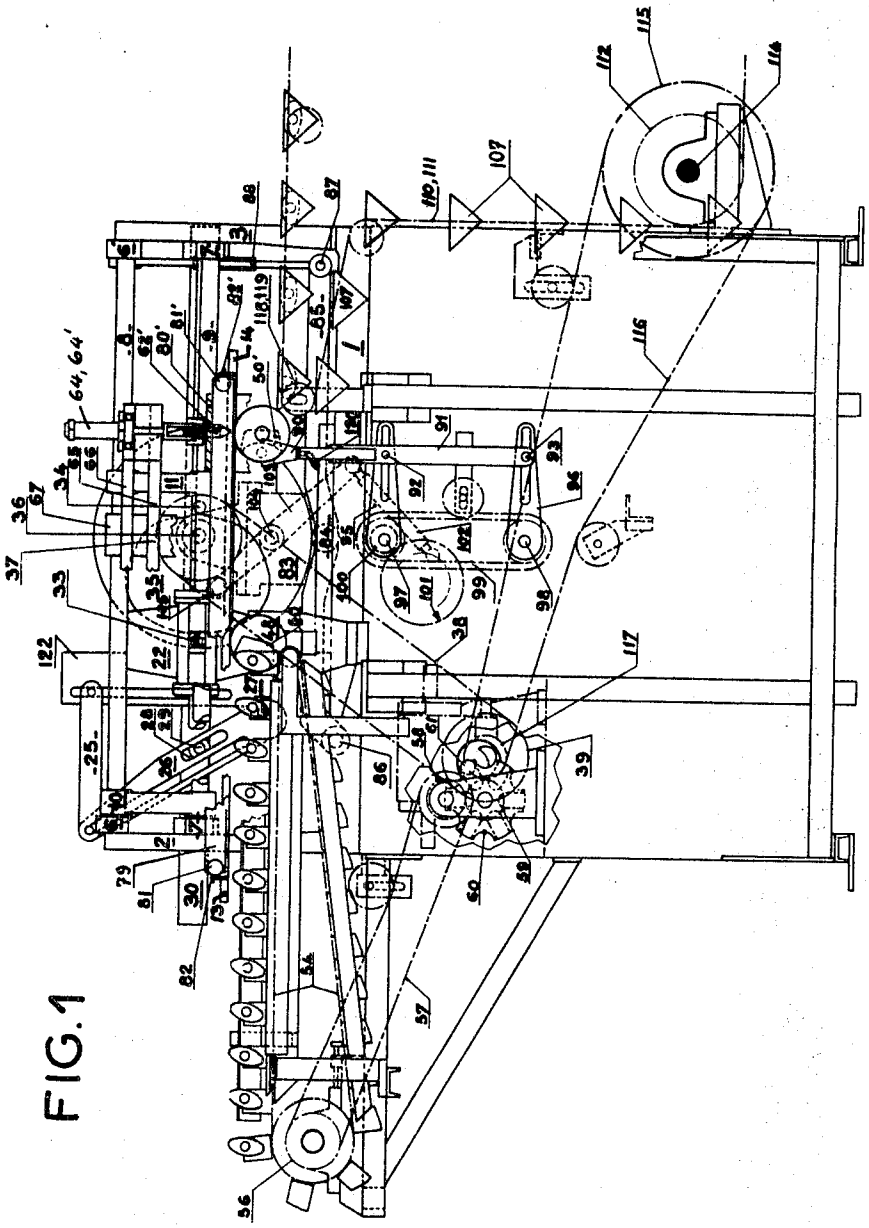


FIG. 1

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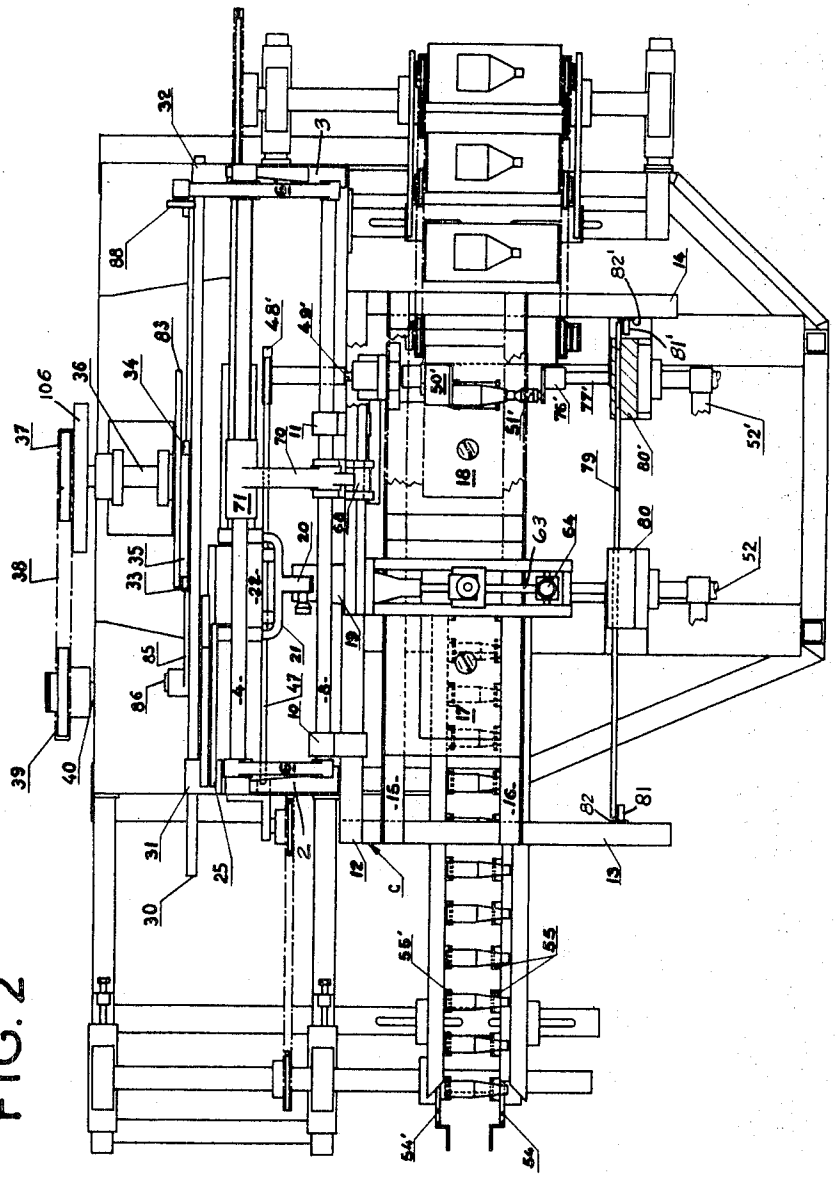


FIG. 2

III

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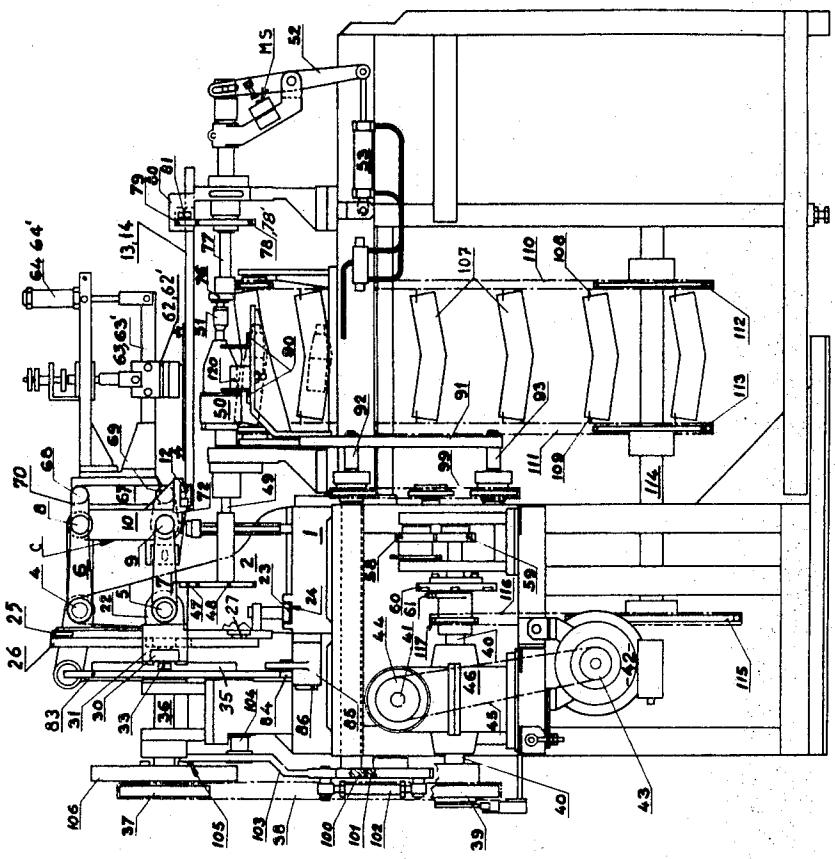
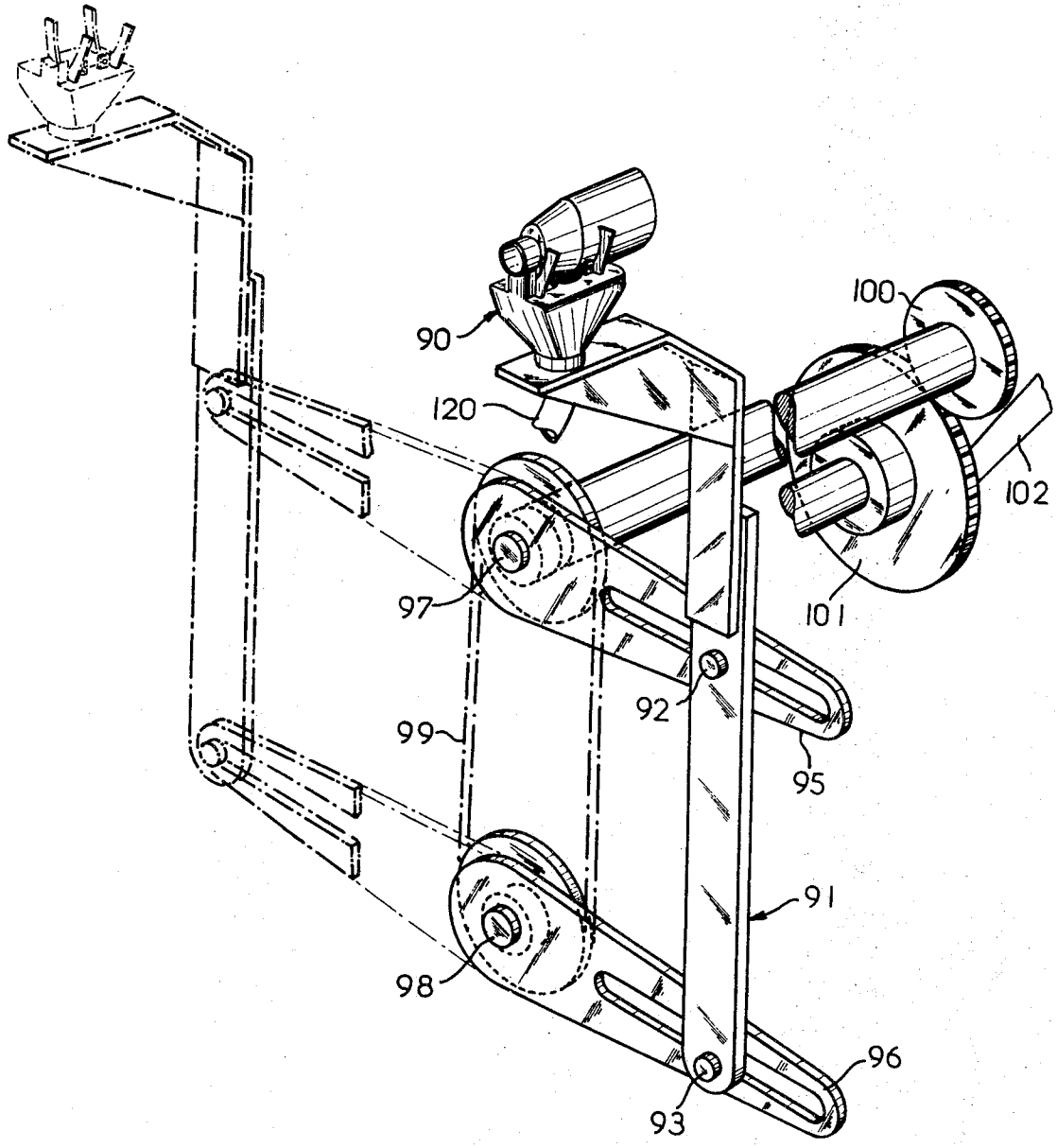


FIG. 3

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FIG. 4




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# APPARATUS FOR AUTOMATICALLY PRINTING TWO FACES OF AN OBJECT

This invention relates to machines for the continuous printing of two surfaces of an object with an oval transverse section and is directed more particularly to machines using the "silk screen" method of printing.

Such machines, and for example, those of the type described in applicant's U.S. Pat. No. 3,286,624 issued on Nov. 22, 1966, generally comprising two printing stations and a transfer means established between the two printing stations for transferring one object from one station to the other, each printing station including a printing device and directly above or below this, a rotary device adapted to seize an object and to make it roll without slipping at contact with the printing device, while the said transfer means is adapted to move from a first position where it seizes an object carried by the rotary device associated with the first printing station, after printing one of the surfaces of the said object to a second position, where it places the said object on the rotary device associated with the second printing station for printing the other of the surfaces of the said object.

An object of the present invention is to provide various improvements to machines of this type, mainly intended to improve the working reliability of the machines and to increase the rate of the work.

In accordance with one aspect of the invention there are provided printing stations for performing silk screen printing, each station comprising a horizontally movable carriage, a silk screen and a scraper carried by the carriage and vertically movable relative to it, in combination with a rotary device formed by a base and a gripping tip movable in the direction of the base for urging an object to be printed toward the base. The base and the tip are synchronously rotated by the action of at least one toothed rack movable horizontally in unison with the screen. The alternating horizontal displacement of the carriage is ensured by a control means, which operates a rotary cam whose profile is made in such a way as to ensure a stopping time, determined with reference to the carriage, at each of the extreme positions of the horizontal displacement.

The gripping of an object in such a machine takes place during the corresponding stopping time of the carriage and is therefore effected in a much more reliable manner. Likewise, it is during the other of these stops of the carriage that the object is released.

In accordance with another aspect of the invention, the transfer device has a course which is tangential to the path followed by an object when it is driven by any one of the rotary devices associated with the printing station.

Thus, the engagement of an object by the rotary device associated to the second printing station, is made in accordance with a movement which continues that of the transfer device in such a way that the latter can return, that is, in the direction of the first printing station, as soon as the object has been seized by the rotary device associated with the second printing station without being obliged to wait until this rotary device has followed a course sufficient to free the said object from the transfer device. The result of this is that the time necessary for the return of the transfer device to the initial period is much shorter and the rate of the machine is substantially increased.

In accordance with a preferred embodiment of the invention, the transfer device comprises a receiving fork for an object supported at the end of a lever forming one of the sides of a deformable parallelogram, the said lever being alternatively driven parallel to itself from a first position, where it is tangential to the course followed by an object on the rotary device associated with the first printing station, to a second position where it is tangential to the course which will be followed by the said object on the rotary device associated with the second printing station.

This particularly simple and robust embodiment is very efficacious and permits the rate of working of the machine rate to be increased by more than 50 percent.



To ensure that, in the course of transferring one object from one printing station to the other, the object is not ejected from the transfer device, this latter is, in accordance with another aspect of the invention, equipped with a suction nozzle disposed in the hollow of the reception fork and adapted to keep the object in place on the fork.

In accordance with another aspect of the invention, the base and the gripping tip of a rotary device associated with a printing station are each set on an independent pinion engaging with a particular toothed rack integral in translation with the associated screen, and the rack associated to the said tip is mounted longitudinally sliding and carries, at each of its ends, a roller cooperating with a flat integral with the screen and perpendicular to the direction of sliding of the said rack.

This device permits the gripping tip to be controlled by a rack different from the rack controlling the associated base, in spite of the vertical movement of the screens during their return to the initial position.

In accordance with another aspect of the invention, the presentation of the objects to be printed at the first printing station is ensured by a transfer chain advancing step by step, controlled synchronously with the carriage which carries the screen, while after printing their second surfaces, the objects are deposited by the rotary device associated with the second printing station on a drying chain advancing continuously, separate from the said transfer chain.

This arrangement allows the machine to be fed at a rate corresponding to the high rate of working this machine, and furthermore permits the continuous direct passing of the objects which have just been printed, into a drying oven disposed upstream from the printing machine.

An embodiment of the invention will now be described by a way of example, with reference to the accompanying diagrammatic drawings, in which:

FIG. 1 is an elevation of a machine embodying the invention, with parts cut away,

FIG. 2 is a plan view with parts cut away and with some parts omitted, and

FIG. 3 is a lateral view in the direction of the arrow III of Fig. 2, again with some parts omitted.

FIG. 4 is a close up view of the transfer mechanism of the present invention.

In the embodiment shown in the drawings, the invention is applied to a printing machine of the type described in the above mentioned U.S. patent; the various elements of this machine will only be described briefly below.

Two parallel supporting end plates **2** and **3**, having the configuration of chairs, supported by a stand **1**, are joined by two vertically superposed horizontal cylindrical bars **4** and **5**.

On the ends of the upper horizontal bar **4** are pivoted arms **6** and **6'** joined by a cylindrical bar **8**. In a similar manner on the ends of the lower horizontal bar **5** are pivoted two arms **7** and **7'** respectively superposed to the arms **6** and **6'**, and joined by a cylindrical bar **9**, vertically superposed to the bar **8**.

On the bars **8** and **9** slides longitudinally a carriage C formed of two vertical arms **10** and **11** slidingly engaged on the bars **8** and **9** and joined by a horizontal bar **12**. As is best seen in FIG. 2, the bar **12** carries two overhung transverse supports **13** and **14** cross braced by bars **15** and **16** and intended to carry silk screens **17** and **18** forming the principal elements of the two printing stations of the machine. The horizontal bar **12** carries on its side opposite the supports **13** and **14**, a yoke **19** in which is engaged an arm **20** integral with a fork **21** articulated on a carriage **22** mounted to be longitudinally movable on the horizontal bar **5**. The carriage **22** furthermore carries a roller **23** which rolls in a guide **24** made in the stand **1** as shown in FIG. 3. Such an arrangement is also shown in the above-cited U.S. patent particularly in FIG. 2 thereof.

In accordance with the present invention, the movement of the carriage **22** is controlled, by means of a flat cam **35**, such as a vertical disc, driven in rotation by a control shaft **36** carrying a pinion **37** around which passes a chain **38** driven by a pinion **39**. The pinion **39** is mounted on the output shaft **40** of

a speed reducer **46** whose input shaft **41** is driven by a motor **42** by means of pulleys **43** and **44** and a transmission belt **45**. The carriage **22** supports a vertical flat iron **122** on which is articulated a link **25** itself articulated at its other end on a lever **26** pivotably mounted at **27** on the frame. The lever **26** has a slot **28** in which is movably engaged a roller or finger **29** supported by a horizontal bar **30** slidably mounted, as shown in Fig. **2**, at **31** and **32** in sleeves respectively integral with the plates **2** and **3** of the frame. The bar **30** also carries two rollers **33** and **34** held in contact with the camming surface of the cam **35** in positions diametrically opposite one another, as shown in Figs. **1** and **2**.

In the following, the corresponding, and identical, respective elements of the two printing stations of the machine are given the same reference numerals and are distinguished one from the other by the use of a prime.

The carriage **22** supports a toothed rack **47** which engages with two pinions **48** and **48'** established at a distance one from the other; the radii of the pinions are equal to the radii of curvature of those surfaces of the oval objects to be printed. The pinions **48** and **48'** are set on shafts **49** and **49'** respectively, at the other ends of which are set support bases **50** and **50'** respectively associated with the two printing stations of the machine. In a manner known per se the rotary devices associated with these printing stations are completed by gripping tips **51** and **51'** carried at the end of arms **76** and **76'** set on shafts **77** and **77'** which are arranged in axial alignment with the shafts **49**, respectively and **49'**. The shafts **77** and **77'** are mounted to be longitudinally slidable in fixed supports under the control of levers **52** and **52'** respectively actuated by pneumatic jacks **53** and **53'**. Furthermore, the shafts **77** and **77'** are respectively integral in rotation with the pinions **78** and **78'** which engage with a toothed rack **79**.

The levers **52** and **52'** are mounted to pivot at a fixed point and each lever carrier a stop capable of actuating a respective microswitch MS and MS'.

In accordance with the present invention, the rack **79** is mounted to be longitudinally slidable in stationary sleeves **80** and **80'**, carried by the machine frame, and carries, at its ends, rollers **81** and **81'** which bear against respective ones of the flat vertical plates **82** and **82'** each integral with a respective one of the supports **13** and **14** carried by the bar **12** of the carriage C.

The scrapers, or squeegees, **62** and **62'** respectively associated with the two printing stations of the machine are mounted on arms **63** and **63'** integral with two horizontal bars **66** and **65'** themselves fixed on a vertical arm **67**. The arm **67** pivots at **68** on a bar **70** supported by a hub **71** rotatably mounted on the bar **4**. The arm **67** also pivots at **69** on an arm **72** which pivots on its other end on the horizontal bar **9**. Thus, as is described in the U.S. patent mentioned above, on the end of the arm **6'** elongated for this purpose is articulated a bar **88** of adjustable length, at the other end **87** of which is articulated a lever **85**. The articulated lever **85** has a fixed pivot point **86** a carrier roller **84** which cooperates with a cam **83** set in rotation on the driving shaft **36** previously mentioned.

In accordance with the invention, the arms **63** and **63'** which carry the scrapers **62** and **62'** are mounted to be vertically displaceable under the control of pneumatic jacks **64** and **64'** which are supported by projections of the machine frame and electrically connected to be activated by microswitches MS and MS'.

The presentation at the first printing station of objects to be printed is ensured by a transfer conveyor belt formed by two parallel synchronous chains **54** and **54'** carrying respectively supports **55** intended to receive the body of the object to be printed and supports **55'** intended to receive the base of these objects. The chains **54** and **54'** pass over a drive pinion **56** rotated by a chain **57** driven by a pinion **58**. The pinion **58** receives its movement from a pinion **59** set on the shaft of a Maltese cross **60** which cooperates with a crank pin **61** set on the output shaft **40** of the reducer **46**.

Between the two printing stations of the machine, there is a transfer device which comprises a fork **90** fixed to the end of a lever **91** articulated at **92** and **93** respectively on two arms **95** and **96** set respectively on two rotative axes **97** and **98** in such a way that the lever **91** forms one of the sides of a deformable parallelogram and is displaced only in translation, *i.e.* so that it maintains its vertical orientation. The axes **97** and **98** are integral with pinions joined by a chain **99**; elsewhere a pinion **100** rigidly mounted on the axis **97** engages with a pinion **101** on which is articulated a link **102** itself articulated on a lever **103**. The lever **103** which pivots about a fixed shaft **104** carries at its other end a roller **105** which cooperates with a hollow cam in a flat vertical disc **106**.

The bottom of the fork **90** is furthermore supplied with a suction nozzle **120** connected to a suction device (not shown).

The machine is completed by a drying chain formed by parallel chains **110** and **111** between which are disposed arms **107** mounted on pivots **108** and **109**, respectively carried by the chains **110** and **111**. The chains **110** and **111** pass over driving pinions **112** and **113** mounted on a shaft **114**, controlled by a pinion **115**, integral in rotation by means of a chain **116** and a pinion **117** on the output shaft **40** of the reducer **46**. The chains **110** and **111** furthermore pass over pinions **118** and **119** arranged near the rotary device associated with the second printing station on the machine and then pass into a drying oven (not shown).

There will now be described the working cycle of the printing machine for printing the two surfaces of the same object. It will be supposed for this purpose, that the object supported by the supports **55** and **55'** of the chain **54** and **54'** has just been gripped by the rotary device **50** and **51** associated with the first printing station. This gripping takes place during the stopping of the carriage C carrying the screens at its furthest left-hand position of corresponding horizontal movement. The cam **35** is conformed in such a way that the carriage C carrying the screens has a determined stop period at each of its end positions in such a way that the gripping point **51** has time to grip the object to be printed with a great reliability.

The carriage carrying the screen C carries out its horizontal translation movement under the control of the carriage **22** itself set to work by the set of rods formed by the link **25**, the lever **26**, the sliding bar **30**, the rollers **33** and **34**, and the cam **35** at the same time, the rotary device **50** and **51** actuated by the rotation of the pinions **48** and **78** which engage respectively with the racks **47** and **79**, apply the gripped objects against the screen **17** and make it roll, without sliding, in contact with the screen, which itself is horizontally displaced while the squeegee **62** applied against the screen **17** remains stationary and ensures the passage through the openings of this screen of the product necessary for the printing of the first surface of the object. When the printing is finished, that is to say when the carriage carrying the screen C arrives at its extreme right-hand position the object with one surface printed, is placed by the rotary device **50** and **51** in the fork of the transfer device, which at this instant occupies a position tangential in relation to the course followed by the said object. Again, since the cam **35** is conformed so that the carriage C carrying the screens makes a determined stop period in each of its extreme positions of sliding, it is possible to retract the gripping tip **51** to withdraw it from, and free, the object with great functional reliability.

The object in course of being printed is now taken in charge by the transfer device and it is important to note that the movement of the latter is initially in a direction substantially tangential to the path followed by the object when it is held by the rotary device **50** and **51** in such a way that the transfer device can immediately enter in action without waiting for a previous withdrawal of the rotary device **50** and **51**. Furthermore, the suction nozzle **120** ensures a secure maintenance of the object in the fork **90** during the transfer of the object from the first to the second printing stations.

Durning the transfer, the following operations are effected in synchronism: the presentation of a new object directly above or below the first printing station by advancement of a step of the chains **54** and **54'** under the control of the Maltese

cross **60**; vertical disengagement of screens **17** and **18** and of the scrapers **62** and **62'** resulting from the deformation of the deformable parallelograms **6, 10, 7** and **6', 11, 7'** under the action of the set of rods comprising successively the cam **83**, the roller **84**, the lever **85**, the bar **88** and the extension of the arm **6'**; and finally return of the carriage C carrying the screens to its initial position as a result of a new movement of the set of rods and the operation of cam **35**. Thus, as will be understood, in a manner known per se the vertical upward movement of scrapers **62** and **62'** is greater than that of the screen **17** and **18** due to the fact that parallelogram **70, 67, 72** which carries the scrapers **62** and **62'** has a lever arm defined by bar **70**, longer than that of the deformable parallelogram described above, which carries the screen **17** and **18**. Thus, as is known, this vertical raising of scrapers **62** and **62'**, with respect to the screens **13** and **14** during the return of the latter into the initial position is necessary to avoid forcing the printing product through the openings of the screens during this movement.

In a similar manner to that which has been described above, the final phase of the movement of the transfer arm **91** to the right is tangential to the movement of the rotary device **50'** and **51'** associated with the second printing station. As a result, the rotary device can immediately take over the control of the object being printed, this takeover occurring during the preset stop period of the carriage C at its extreme left-hand position of its horizontal displacement. This interposition is made in a manner known per se by advance of the tip **51'** in the direction of the base **50'** under the control of the lever **52'** operated by the jack **53'**.

The tangential movement of the lever **91** permits it to withdraw immediately, by continuing its circular movement so as to move downwardly and to the left, as soon as the object has been taken in charge by the rotary device **50'** and **51'** without waiting for this device to have started its rotation; from this results a reduction in the time necessary for the return of the transfer device to its initial position, the extreme left-hand point of its circular travel path, and as a consequence a substantial improvement in the rate of operation of the machine.

As will be understood, the printing of the second surface of the object is made in a similar manner to the printing of the first surface and during the printing of this second surface at the second printing station, the first face of a new object is printed at the first printing station.

The object whose two surfaces have just been printed is deposited by the rotary device **50'** and **51'** associated with the second printing station in one of the balancing arms **107** of the drying chain **110** and **111** and is led into the associated drying oven.

The rack **79** which engages with the driving pinions **78** and **78'** of the gripping tips **51** and **51'** is brought back into the initial position by the carriage carrying the screen C, during the return movement of the latter. As has been seen, the rollers **81, 81'** carried by the said ratchet cooperate for this purpose with vertical plates **82, 82'** integral with the carriage for carrying the screen C.

If, during the advanced movement of any of the gripping tips **51, 51'**, there is not an object to seize the corresponding lever **52, 52'** closes the associated microswitch MS, MS', and this actuates the corresponding jack **64, 64'** in such a way that the associated squeegee **62, 62'** is raised from the corresponding screen and there is therefore no drive of the printing product through the screen during the movement of the carriage carrying the screen C.

I claim:

**1.** In a machine for printing, in a single pass, two surfaces of an object having an oval transverse section, comprising:

a. a first printing station including:
   i. a first printing means; and
   ii. a first rotary means in register with said first printing means and arranged to grip an object and carry it in a circular path to roll without sliding in contact with said first printing means;

b. a second printing station including:
   i. a second printing means; and
   ii. a second rotary means in register with said second printing means and arranged to grip an object and carry it in a circular path to roll without sliding in contact with said second printing means;

c. a transfer means disposed between said first and second printing stations and composed of a transfer lever, a fork carried at the end of, and rigidly connected to, said lever for receiving an object and for transferring such object from one printing station to the other, and a suction nozzle disposed in the hollow of said fork;

d. means for displacing said transfer means from a first position where it receives an object carried by said first rotary means after printing of one surface of the object, to a second position where it places said object in said second rotary means for printing of the other surface of the object, said means for displacing being composed of two parallel arms articulated on said lever at two distinct pivots, and two axes spaced vertically from one another at a distance equal to that of said pivots, each said arm being mounted on a respective one of said axes for rotation therewith, the improvement wherein;

e. said arms, said lever and said axes constitute a mechanical deformable parallelogram linkage for moving said transfer means only in translation along a circular path;

f. said machine further comprises synchronizing means connected between said rotary means and said axes for rotating said axes unidirectionally in synchronism with said rotary means in a manner such that said transfer means are driven in translation in only one direction along a circular path between said first position where its path is tangential to the course followed by an object on said first rotary means and said second position where its path is tangential to the course to be followed by such object on said second rotary means;

g. said axes are positioned so that said first and second positions of said transfer means are at respectively opposite sides of the vertical plane passing through both of said axes; and

h. said means for displacing said transfer means are arranged for moving said transfer means in one direction along a circular path tangential to the paths imparted to objects by both of said rotary means, the circular path followed by said transfer means having an upper half along which said transfer means moves in a direction from said first station to said second station and a lower half along which said transfer means moves back from said second station to said first station.

**2.** A machine as defined in claim **1** further comprising:

control means for imparting alternating horizontal displacements to said carriage;

a transfer chain connected for controlling the delivery of objects to said first printing station;

first drive means connected to advance said transfer chain in a step-by-step manner in synchronism with the alternating displacements of said carriage;

a drying chain distinct from said transfer chain and positioned for receiving objects from said second printing station after such objects have been printed therein; and

second drive means connected to impart a continuous movement to said drying chain.

**3.** In a machine for printing, in a single pass, two surfaces of an object having an oval transverse section, comprising:

a. a first printing station including:
   i. a first printing means; and
   ii. a first rotary means in register with said first printing means and arranged to grip an object and carry it in a circular path to roll without sliding in contact with said first printing means;

b. a second printing station including:
   i. a second printing means; and
   ii. a second rotary means in register with said second printing means and arranged to grip an object and carry it in a circular path to roll without sliding in contact with said second printing means;

c. a transfer means disposed between said first and second printing stations and composed of a transfer lever and a fork carried at the end of said lever for receiving an object;

d. means for displacing said transfer means from a first position where it receives an object carried by said first rotary means after printing of one surface of the object, to a second position where it places the object in said second rotary means for printing the other surface of the object, said means for displacing being composed of two parallel arms articulated on said lever at two distinct points, and two axes spaced vertically from one another at a distance equal to that of said pivots, each said arm being mounted on a respective one of said axes for rotation therewith, the improvement wherein;

e. said means for displacing said transfer means moves said transfer means in a course tangential to the circular path followed by an object in at least one of said rotary means;

f. said arms are set on said axes and said axes are controlled to pivot in synchronism with said rotary means associated with said printing stations in such a way that said transfer lever forms one of the sides of a deformable parallelogram and is driven only in translation between said first position where it moves tangentially to the course followed by an object on said first rotary means and said second position where it moves tangentially to the course which will be followed by the object on said second rotary means; and

g. said two axes of said transfer means are integral in rotation with a common pinion and, for control of the pinion, said transfer means comprises a cam mounted for rotation in synchronism with said rotary means, a control lever articulated at a fixed point, a roller carried at the end of said control lever and held in contact with said cam, and a joining link articulated to said control lever and to said pinion.

4. In a machine for printing, in a single pass, according to the open silk screen process, two surfaces of an object having an oval transverse section, comprising:

a. a movable carriage;

b. a first printing station including:

i. a first printing means; and

ii. a first rotary means in register with said first printing means and arranged to grip an object and carry it in a circular path to roll without sliding in contact with said first printing means;

c. a second printing station including:

i. a second printing means; and

ii. a second rotary means in register with said second printing means and arranged to grip an object and carry it in a circular path to roll without sliding in contact with said second printing means;

d. each said printing means comprising a silk screen and a scraper carried by said carriage and movable vertically with respect thereto, and each said rotary means comprising a base and a gripping tip movable in the direction of said base for applying an object to be printed against said base;

e. at least one rack movable horizontally together with said screens of both of said printing means and connected to drive said base and said tip of each said rotary means in synchronous rotation;

f. transfer means disposed between said first and second printing stations for transferring such object from one printing station to the other; wherein;

g. means for displacing said transfer means from a first position, where it receives an object carried by said first rotary means after printing of one surface of the object, to a second position, where it places said object in said second rotary means for printing of the other surface of the object, the improvement wherein;

h. said means for displacing said transfer means moves said transfer means in a course tangential to the circular path followed by an object in at least one of said rotary means; and

i. said machine further comprising control means for imparting alternating horizontal displacements to said carriage, said control means including: a rotatable cam having a profile which ensures a determined stop period for said carriage at each of the extreme ends of its horizontal displacement; a bar mounted to be longitudinally slidable; two rollers carried by said bar to contact said cam at positions diametrically opposite each other; a lug supported by said bar and constituting a pivot; a lever pivotally mounted at a fixed point and provided with a slot in which said pivot is engaged; and an articulated link connected between said lever and said carriage.

5. In a machine for printing, in a single pass, according to the open silk screen process, two surfaces of an object having an oval transverse section, comprising:

a. a movable carriage;

b. a first printing station including:

i. a first printing means; and

ii. a first rotary means in register with said first printing means and arranged to grip an object and carry it in a circular path to roll without sliding in contact with said first printing means;

c. a second printing station including;

i. a second printing means; and

ii. a second rotary means in register with said second printing means and arranged to grip an object and carry it in a circular path to roll without sliding in contact with said second printing means;

d. each said printing means comprising a silk screen and a scraper carried by said carriage and movable vertically with respect thereto, and each said rotary means comprising a base and a gripping tip movable in the direction of said base for applying an object to be printed against said base;

e. transfer means disposed between said first and second printing stations for transferring such object from one printing station to the other;

f. means for displacing said transfer means from a first position, where it receives an object carried by said first rotary means after printing of one surface of the object, to a second position, where it places said object in said second rotary means for printing of the other surface of the object, the improvement wherein;

g. said means for displacing said transfer means moves said transfer means in a course tangential to the circular path followed by an object in at least one of said rotary means, and said machine further comprises;

h. control means for imparting alternating horizontal displacements to said carriage, said control means including: a rotatable cam having a profile which ensures a determined stop period for said carriage at each of the extreme ends of its horizontal displacement;

i. two racks movable horizontally together with said screens of both of said printing means, one of said racks being connected to drive said bases of both of said rotary means and the other of said racks being connected to drive said tips of both of said rotary means in synchronism with said bases;

j. means supporting said other of said racks for permitting it to slide only in a longitudinal horizontal direction;

k. means defining two flat surfaces integral with said carriage and extending perpendicular to the direction of movement of said other of said racks, each said surface being adjacent a respective end of said other of said racks;

l. two rollers each mounted on a respective end of said other of said racks and engaging a respective one of said surfaces; and

m. whereby said surfaces bear against said rollers even if said carriage is moved into a raised position.

# UNITED STATES PATENT OFFICE

# CERTIFICATE OF CORRECTION

Patent No. 3,533,353 Dated October 13th, 1970

Inventor(s) Louis Gilbert Dubuit

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading of the patent, line 2, change "Vetrune" to --Vitruve--. Column 3, line 29, change ",respectively and 49' " to --and 49', respectively--. Column 5, line 26, change "its" to --the--. Column 7, line 65, change "; wherein;" to --,and--.

SIGNED AND SEALED FEB 9. 1971

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents



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