

Sept. 6, 1960

Filed Oct. 9, 1959

L. G. DUBUIT
MACHINE FOR PRINTING ON BODIES OF REVOLUTION
BY THE SILK SCREEN PROCESS

2,951,440

5 Sheets-Sheet 1

Fig. 1

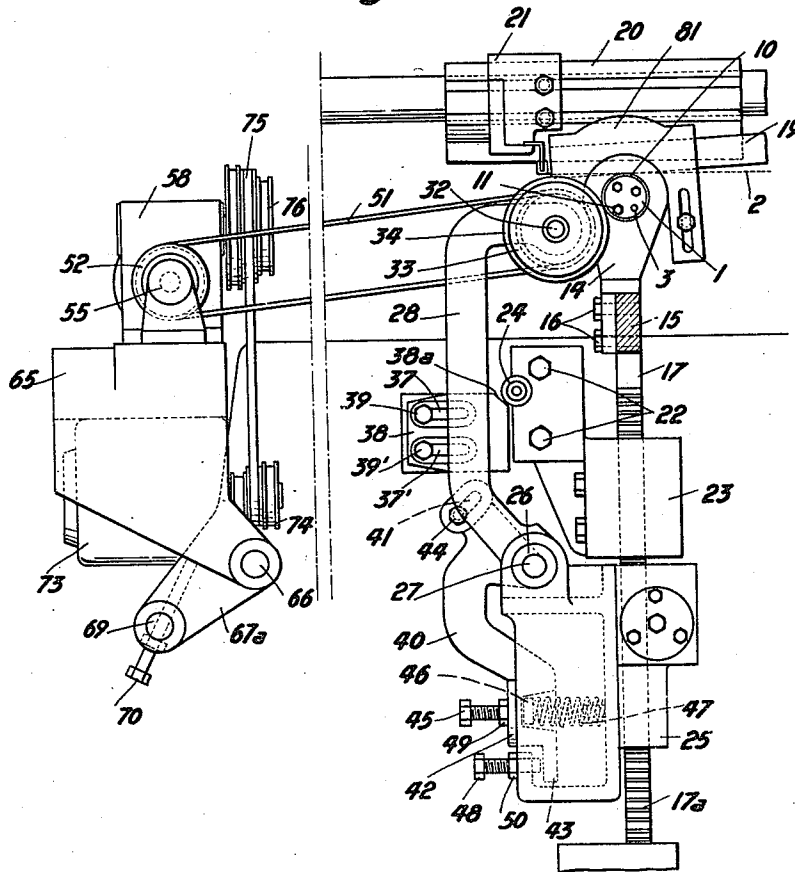
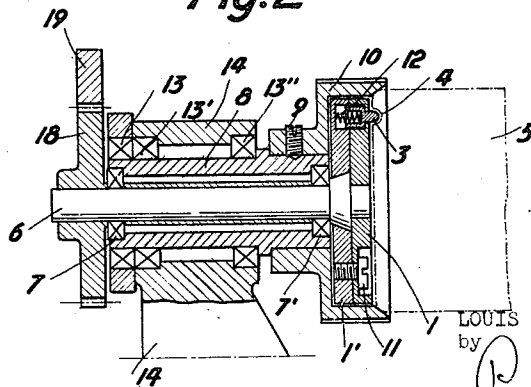


Fig. 2



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Fig. 3

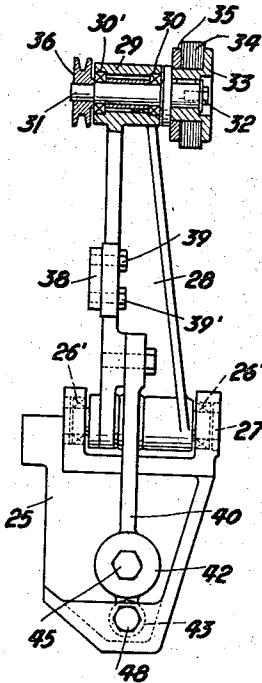


Fig. 4

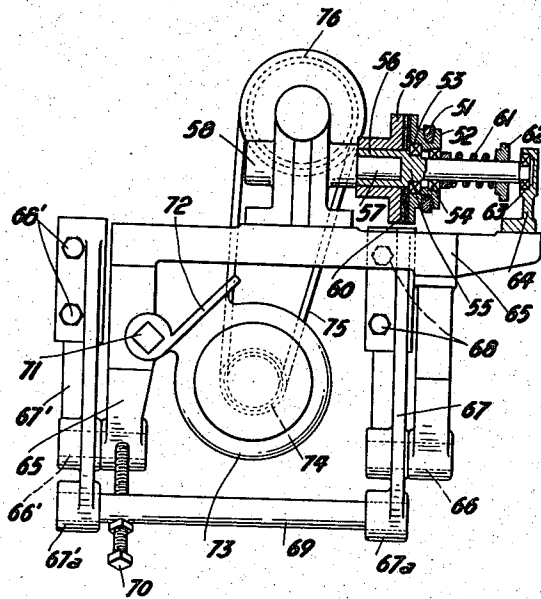
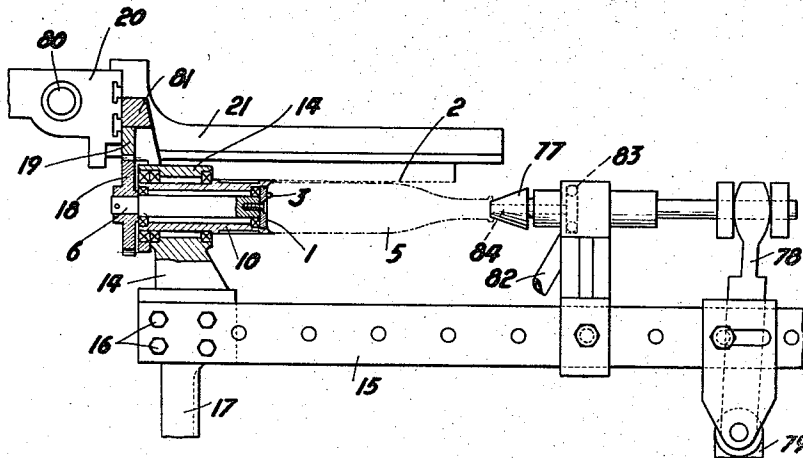


Fig. 5



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Fig. 6

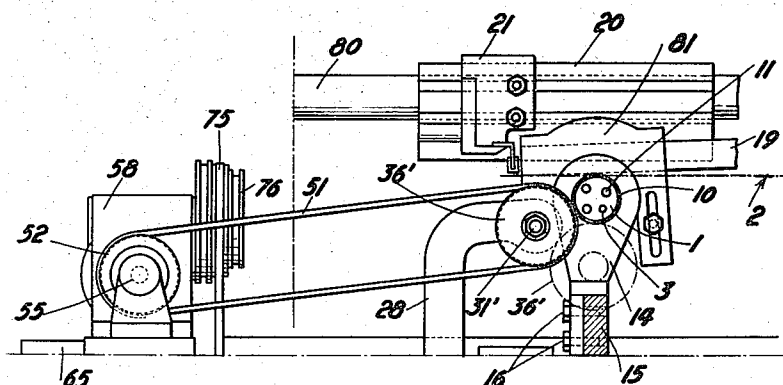
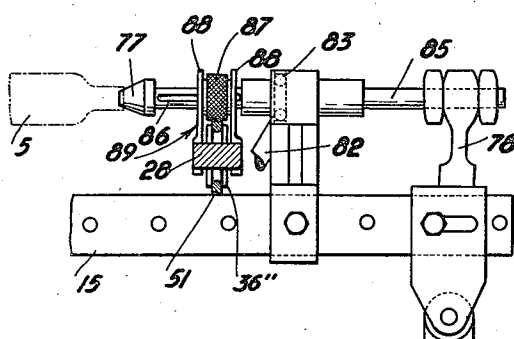


Fig. 7



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Fig. 8

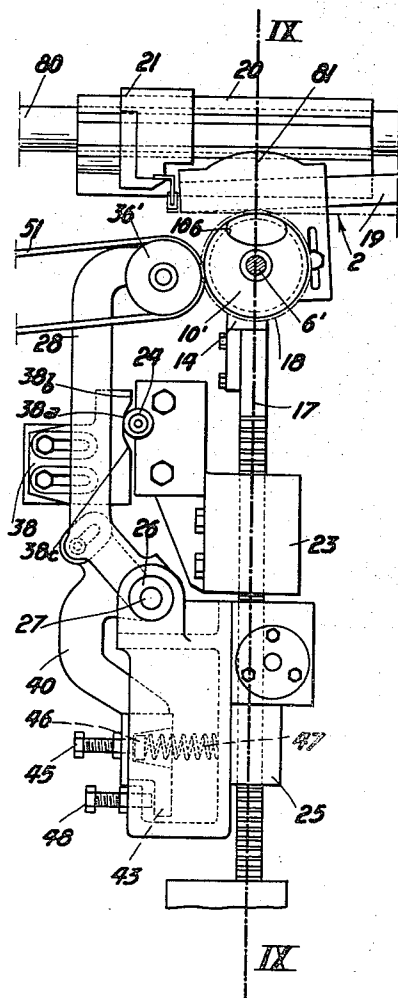


Fig. 10

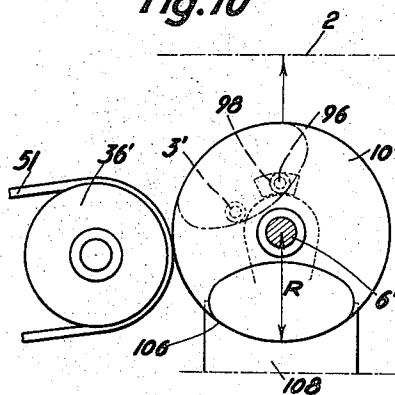


Fig. 11

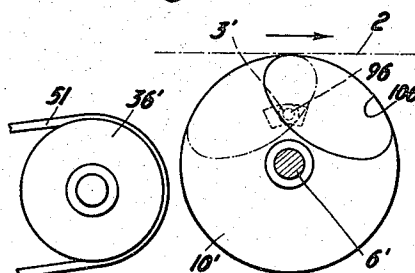
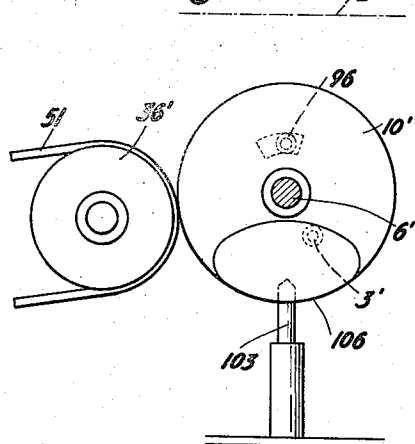


Fig. 12



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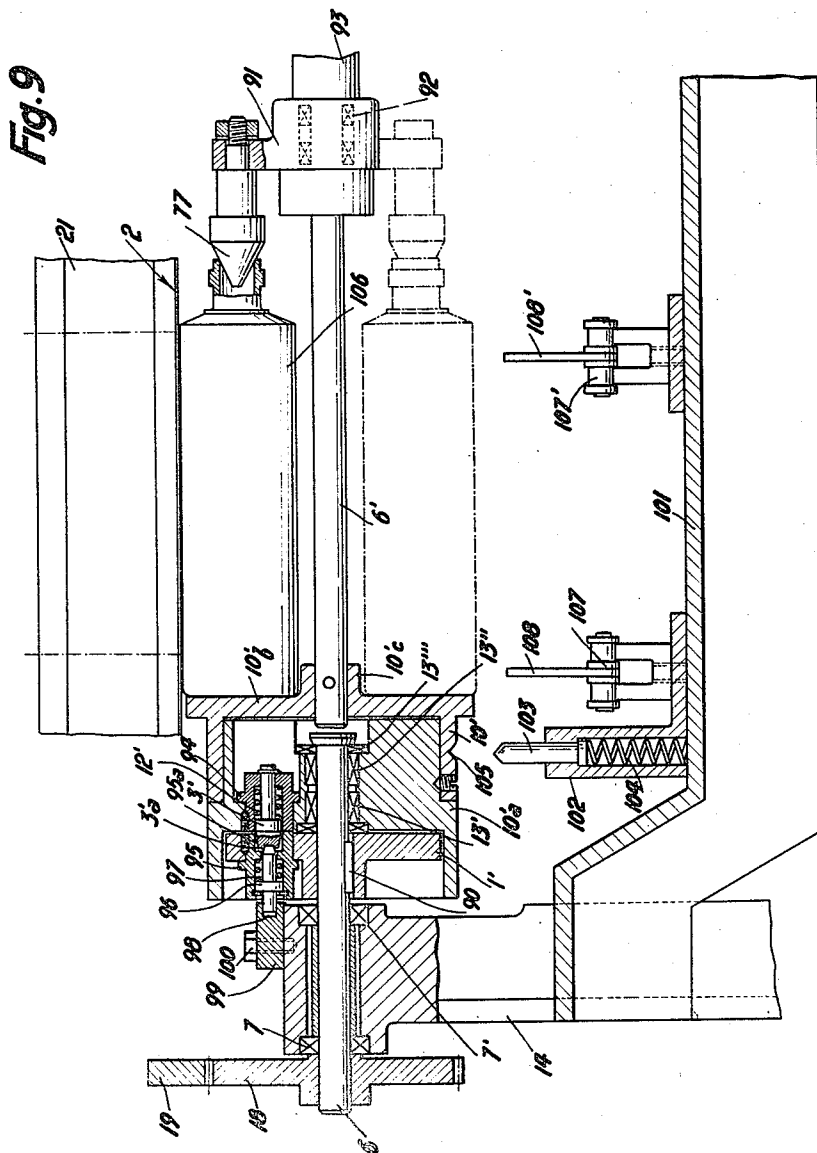
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5 Sheets-Sheet 5



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2,951,440

MACHINE FOR PRINTING ON BODIES OF REVOLUTION BY THE SILK SCREEN PROCESS

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14 Claims. (Cl. 101—126)

The present invention relates to a reference-marking device for printing on bodies of revolution by methods such as the silk screen process or the offset process.

Since the application of these processes to printing on cylindrical bodies such as bottles, receptacles or other bodies of revolution, means have been sought which would enable this printing to be carried out at fixed pre-determined points on the outer surface of these objects, whether the printing is carried out in single colour or multi-colour. In both cases, it was necessary to resort to a mechanically-marking means for enabling the object to be located in a strictly determined position with respect to the silk screen.

In 1952, the present applicant created a device for locating the position of bottles, on the bottom of which was formed a recess with which engaged a nipple carried by a cap driven in synchronism with the straight-line movement of the silk screen, so as to drive the bottle with the nipple.

It will immediately be clear that in order to cause the recess of the body to be printed to coincide with the nipple of the cap, it is necessary to rotate the body with respect to the nipple until the latter engages in the recess.

This operation is generally carried out manually and requires a certain time, which appreciably reduces the output of the machine. For this reason, certain manufacturers have tried to make this putting in position automatic, but the devices constructed up to the present time form an integral part of the machine and do not enable this latter to be adapted for the printing of objects having widely-different dimensions and varied forms of curvature.

The present invention has for its object to provide a device which enables existing machines to be readily transformed so as to permit the nipple to be engaged automatically and rapidly in a recess formed on the supporting face of the body to be printed. This device is applicable not only to the case of silk screen printing considered above, but also to all methods of printing a body of revolution, with rotation of this body about its axis of revolution and a corresponding displacement of a printing member tangentially to the said body, which is especially the case with printing by offset, when the blanket is moved tangentially to a body of revolution to be printed, the said body being simultaneously driven in rotation. In the description which follows, by the term "printing member" is meant the members such as the silk screen or the blanket above-mentioned.

The device forming the object of the invention thus comprises a pulley capable to drive in rotation the unit formed by a pre-centering sleeve, the object to be printed and the counter-head which presses the said object against the sleeve, in such manner as to bring the said unit into an angular position such that, with reference to a cap driven synchronously with the silk screen, the printing can be carried out on the surface of the object and by virtue of

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marker members interposed between the said cap and the said unit, from a pre-determined point of origin of the said surface. The said pulley is in turn driven in rotation by means of a belt from a separate motor through a speed-reducing gear and a torque-limiting device such as a friction system, and it is carried by an oscillating arm which moves it away from or into the contact position with respect to any one of the elements forming the said unit, under the impulsion of a lifting device which brings the surface of the object into contact with the silk screen or moves it away from said screen; the movements of the said lifting device are controlled by the regulating cam of the machine controlling in synchronism the movements of the silk screen.

The pivotal axis of the oscillating arm which carries the driving pulley is fixed on a support of the lifting device raising or lowering the sleeve-object-counter-head unit, a roller mounted in a fixed position on the frame of the machine being intended to co-operate with a cam face formed on the said arm in order to push back this latter and to move away the pulley which it carries from the member of the unit with which the said pulley should normally come into contact, when the said arm is raised at the same time as the said unit, so that the pulley can first of all drive the unit in rotation until the marking member which it carries is in engagement with the reference member carried by the cap, and being afterwards stopped under the retaining force applied by the stationary unit, compelling the torque-limiting device to slip until the moment when the cam face and the fixed roller move the pulley away from the object-carrier unit, after which the pulley can then again rotate freely.

The arm carrying the pulley is provided at its lower portion with an extension on which acts a spring with an adjustable tension, intended to apply the pulley or its fitting against the element of the object-carrier unit by means of which it normally drives the said unit.

An adjustable stop carried by the lifting device limits the amplitude of the pivotal movement of the arm by acting on the extremity of the extension of the said arm.

The cam face carried by the arm is adjustable in position in order to correspond to the dimensions of the objects to be printed.

The motor and the speed-reducing driving gear of the pulley may be mounted on a pivoted cradle enabling the belt coupling the said driving gear to the pulley to be kept tight, an adjustable stop limiting the travel of the pivotal movement of the said cradle and in consequence the effort applied to the shaft of the said pulley.

The extension of the arm pivots about the axis of oscillation of the arm and can form with this latter an adjustable angle, by means of a curved slot formed in the said extension and a screw screwed into the arm, as a function of the diameter of the object to be printed.

The driving pulley is provided with an elastic ring intended to come into contact with the element of the object-carrier unit which the pulley should normally drive.

The drive of the said unit may also be effected by the outer face of the belt passing over the pulley and rolling with the latter, the said face coming directly into contact with one of the elements forming the unit.

The cap driven in synchronism with the silk screen is provided with a marking nipple or dolly which can be withdrawn into the said cap, and the pre-centering sleeve turns freely around it when the sleeve is driven by the driving pulley, the front edge of the said sleeve extending beyond the cap at the periphery of the cap so as to be able to come into contact with the object to be printed and to drive the latter until the marking nipple or dolly of the cap is engaged in a reference recess formed in the bottom of the said object.

The marking nipple or dolly is housed in a recess formed in the cap and is subjected to the thrust of a spring located in the said recess.

The pre-centering sleeve rotating freely around the cap driven in synchronism with the silk screen can be closed by a plate which carries a secondary shaft provided at its extremity with a crank on which is fixed the pressure counter-head, so as to permit the latter to be driven in synchronous rotation with the sleeve; a withdrawable dolly being placed towards the rear on the said plate in such manner that it can be engaged in a recess formed in the cap rigidly fixed to the first shaft and an ejector finger being operated by a fixed cam face and passing through the said recess in order to enable the sleeve of the cap to be freed by pushing back the said withdrawable dolly at a point of the cycle of synchronous rotation of the two elements; a locking finger eventually immobilizes the sleeve and the pressure head after the object has been printed.

The cap and the driving sleeve for the object to be printed can be removed and replaced by caps and sleeves of different diameters, corresponding to the dimensions of the objects to be printed.

Two forms of construction of the device forming the object of the invention, applied to printing by the silk screen process, are described below by way of examples only, reference being made to the accompanying drawings, in which:

Fig. 1 shows a general view of the device in front elevation;

Fig. 2 shows a cross-section to a larger scale of the cap and the object-carrier sleeve;

Fig. 3 is a profile view with partial cross-section of the pivoted arm and the pulley which carries the elastic ring;

Fig. 4 shows a profile view of the cradle which carries the driving members of the said elastic ring;

Fig. 5 shows a profile view of the object-carrier unit;

Fig. 6 shows in elevation a method of driving by belt of the marking sleeve or of the object to be printed;

Fig. 7 represents a form of construction in which the drive of the reference marking device is applied to the shaft which carries the pressure head;

Fig. 8 shows a front elevation of the essential portion of the modified device;

Fig. 9 is a cross-section taken along the line IV—IV of Fig. 8 of the object-carrier unit;

Figs. 10 to 12 show various phases of the operation of the modified device.

In a first form of embodiment, given by way of example only and without any limitative restriction, the reference marking device is constituted in the following manner.

On a cap 1 (Figs. 1 and 2) which is intended in known manner to maintain the body of revolution to be printed and to drive it in rotation during the course of printing, in synchronism with the straight-line movement of the silk screen 2, is mounted a dolly 3 formed in such manner as to be engaged in a recess 4 formed in the bottom of the receptacle or other body 5 to be printed.

The cap 1 is movable on the shaft 6 which carries it and can be replaced by other caps having a diameter corresponding to that of the object to be printed. The shaft 6 is mounted in two ball bearings 7 and 7', housed in a sleeve 8 on which a mandrel 10 with a fluted periphery is fixed by a screw 9, the mandrel comprising at its front portion a cavity in which the cap 1 is housed. The edge of this cavity is bevelled in order to centre the object to be printed.

According to the invention, the cap is formed by two discs 1 and 1' connected together by screws 11. In the two discs are formed holes intended to receive the dolly 3 which is constantly urged towards the exterior by a spring 12.

The sleeve 8 is mounted by ball bearings 13, 13', 13'' in a bearing block 14 carried by a horizontal rod 15 fixed

by means of screws 16 to the extremity of a vertical rod 17 provided with a row of rack teeth 17a. This toothed rack is actuated by the machine, which causes it to move upwards and downwards alternately with the bar 15, the bearing 14 and the object carrier cap 1.

On the shaft 6 is keyed a pinion 18 engaging with a toothed rack 19 pivotally mounted on the trolley 20 carrying the arm 21, on which is mounted the silk screen 2.

A support 23 which carries a roller 24 is fixed on the frame of the machine by means of screws 22.

On the rack-rod 17 is fixed a casing 25 carrying ball bearings 26 and 26' (Fig. 3) in which can pivot a shaft 27. On this latter is keyed an arm 28 provided at its upper part with a bearing block 29, in which a shaft 31 is mounted by means of ball bearings 30 and 30'. On the front portion of the said shaft is fixed by means of a screw 32 a pulley 33 carrying a ring 34 of rubber or similar material retained by a metal ring 35. On the rear part of the shaft 31 is keyed a grooved pulley 36.

On the arm 28 are arranged two slides 37 and 37' which enable a small plate 38 to be fixed on the arm by means of screws 39 and 39' which regulates the position of the arms. The plate 38 has a cam face 38a intended to make contact with the roller 24.

The arm 28 carries a further arm 40 provided with a slide 41 at its upper part and at its lower part with a dished member 42 and a tail 43. The arm 40, which rotates freely on the shaft 27, is fixed on the arm 28 by means of a screw 44 which passes through the slide 41.

The dished plate 42 is traversed by a screw 45 provided at its extremity with a buffer 46 on which is supported a spring 47 housed in the dished plate and applied at its other end against the wall of the casing 25. The tail 43 comes into abutment against a screw 48 passing through an edge of the said casing.

The spring 47 constantly forces back the arm 40, and the travel of the latter is limited by the abutment screw 48 which enables the amplitude of pivotal movement of the arm 40 about the axis of the shaft 27 to be varied.

The thrust effort of the spring 46 can be regulated in the same way by the screw 45.

Lock nuts 49 and 50 are provided to lock the screws 45 and 48 respectively after adjustment.

It will be understood that the slide 41 and the screw 44 enable the angle formed by the two arms 28 and 40 to be modified so as to bring the elastic ring 34 closer to or farther away from the mandrel 10 with which it may come into contact under the pressure of the spring 47. It is thus possible to adjust the travel of the lever 28 to the diameter of the mandrel 10 which should correspond to the diameter of the object to be printed.

The pulley 36, locked on the shaft 31 of the pulley 33 is coupled by a belt 51 (Figs. 1 and 4) to a pulley 52 mounted to rotate freely by means of bearings 53 and 54 and sliding on a shaft 55 forming an extension of a sleeve 56 coupled to the output shaft 57 of a speed-reduction gear 58.

On the sleeve 56 is keyed a plate 59, between which and the pulley 52 is mounted a friction lining 60. The pulley 52 is clamped against the said lining by a spring 61, the pressure of which can be adjusted by a knob 62 screwing on the shaft 55 which pivots by means of a ball bearing 63 in a bearing block 64 fixed on a cradle 65. The said cradle is pivoted about shafts 66 and 66' carried by brackets 67 and 67' fixed on the frame of the machine by means of screws 68 and 68'.

The brackets 67 and 67' are extended downwards by arms 67a and 67'a which carry a rod 69 in which is screwed a stop-screw 70 limiting the rocking movement of the cradle 65.

In the interior of the cradle is mounted a shaft 71 carrying a platform 72 on which is fixed an electric motor 73, having a three-step pulley 74 which is coupled

by a belt 75 to a pulley 76 also of the three-step type, carried by the input shaft of the speed-reduction gear 58.

It can be seen that the belt 75 is tensioned by the weight of the motor 73 which oscillates about the shaft 71. On the other hand, the belt 51 is tensioned by the weight of the cradle oscillating about the shafts 66 and 66', but within the limit permitted by the stop-screw 70 which prevents an excessive tractive effort on the shaft 31 of the elastic ring 34.

The rotating head or counter-head 77 is subjected to the action of a lever 78 pivoting about a shaft carried by a member fixed on the bar 15 which is fixed in turn to the vertical rod 17 of the lifting system. The lever 78 is normally subjected to the pressure applied to it by a spring forming part of the machine, through the intermediary of a further lever 79, the spring pushing the head towards the cap 1 with the object of gripping between it and the latter, the object to be printed, which may be a bottle, a receptacle or any body of revolution or having curved faces.

In a manner known per se and which is quite independent of the present invention so that it does not require to be described here in detail, a cam located inside the machine and in co-operation with the movement of the screen, acts on the lever 78 in order to overcome the action of its return spring and in order to enable, by bringing back the head 77, the operator to withdraw the object already printed and to replace it by another to be printed.

The operation of the reference-mark device described above is as follows:

At the end of each printing, the unit formed by the rack 17a (Figs. 1 and 5), the support 25, the bearing 14 with the pinion 18, the bar 15, the rotary pressure-head 77 and its operating lever 78, moves downwards to its lowest point. In this position, the cam face 38a has moved away from the roller 24, and under the action of the spring 47, the elastic driving ring 34 is in engagement with the fluted periphery of the mandrel 10 and drives this latter in rotation.

The operator removes the printed object which is automatically freed by the head 77 at the moment considered, then he replaces it by another to be printed, a bottle 5 for example, the bottom of which is provided with a recess 4 (Fig. 2) intended to receive the dolly 3 of the cap 1.

When the bottle is placed in position, the spring device, freed by the above-mentioned cam, pushes the bottle against the mandrel 10 and it is at this moment that the upward movement of the object-carrier unit takes place towards the silk screen 2, under the action of a mechanism which is also known.

By coming into contact with the dolly 3, the bottom of the bottle had pushed it into the cap, but during the course of rotation of the bottle, the recess 4 has come opposite the dolly and the latter has passed into the recess, thus preventing the bottle from rotating. The bottle then stops the mandrel 10 and the driving ring 34. For this reason, the pulley 52 slips against the lining 60 of the pulley 56 which alone continues to rotate.

During the course of the upward movement however, the cam face 38a comes into contact with the roller 24, and the arm 28 is moved away from the object-carrier. The driving ring 34 ceases to make contact with the mandrel 10, the cradle 65 pivots and maintains the tension of the belt 51. The said ring can thus again rotate, while the mandrel 10 remains stationary.

When the object carrier is at its uppermost point, the trolley 20 which carries the screen 2 is driven along its rails 80 (Fig. 5) and the screen comes into contact with the bottle 5. The toothed rack 19, driven by the trolley 20 and guided by the bridge-piece 81 causes the pinion 18, the shaft 6 and the cap 1 to rotate, the latter driv-

ing the bottle in synchronism with the displacement of the silk screen.

At the end of the travel, the printing being completed, the object-carrier unit again moves downwards, the head 77 moves away and the operator can remove the bottle. Simultaneously, the driving ring 34 again comes into contact with the mandrel 10 which it drives, and the cycle begins again.

In the case of certain flexible receptacles, the head 10 77 can introduce into them compressed air coming through a pipe 82 into a slide-valve device 83, which directs the air into a channel 84 passing through the head 77.

In the form of embodiment shown in Fig. 6, the centering sleeve 10 surrounding the cap 1 which carries the reference-mark finger or dolly 3 can rotate independently of the said cap. Its peripheral surface is grooved in order to increase its adhesion to the outer face of the belt 51 driving a grooved pulley 36' keyed on the shaft 31' which is carried by the pivoted arm 28.

In this form of construction, the elastic ring previously described is thus dispensed with, and the construction of the system is in this way simplified to an appreciable extent.

The general operation of the device remains exactly the same, the only difference consisting in that it is the back of the belt 51 which drives the centering sleeve 10 directly.

30 It can easily be seen that the back of the belt 51 could just as well make contact with the object to be printed, when placed in position in the centering sleeve 10, by engaging the said object either at the side or from below, as shown in dotted lines in Fig. 6.

35 The direct drive of the object could obviously be effected by an elastic ring of the type described above.

Fig. 7 shows a further form of construction in which the drive of the unit: head 77, object 5 and cap 10 is effected by driving the shaft 85 which carries the pressure head 77. To this end, the said shaft is provided with a longitudinal groove 86 which enables it to slide with respect to a pulley 87 with which it is fixed for rotation by a sliding key. The pulley 87 is flanked by the arms 88 of a fork-shaped member 89 carried by the pivoted arm 28. The arms 88 are astride the shaft 6 and keep the pulley 87 constantly facing a grooved pulley 36'' over which passes the belt 51.

It will at once be evident that when the arm 28 brings the pulley 36'' up to the pulley 87, the back of the belt 50 51 comes into contact with the pulley 87 and drives it.

The pulley 87 is preferably grooved over its peripheral face.

In this case again, the pulley 36'' could be rigidly fixed to an elastic ring acting on the pulley 87 in the manner previously described.

It is furthermore necessary to recall that direct printing by the silk screen process cannot be carried out unless the bodies to be printed have a wholly or partly developed surface which enables the scraper to be perpendicular at every instant to the plane tangential to the object represented by the screen.

In the previous form of embodiment however, certain parts of the device described by way of example are more specially designed for printing cylindrical bodies of circular section. But it can readily be understood that the said device is equally well applicable for printing cylindrical bodies of oval section, and in a more general way, all bodies which have a surface capable of rolling between the silk screen by rotating or pivoting (in the case of a cone) about a real or virtual axis.

The second form of construction of the device described below enables the device to be applied to the printing of bodies of any kind having at least one surface constituted by a succession of straight generator lines rotating about an axis, or having a surface which may be considered as

an element of a cylinder or a cone with a circular base.

Figs. 8 and 9 show an alternative form of the device, enabling the latter to print, with respect to reference marks, bodies other than those comprising cylindrical parts of circular section.

In this alternative form, the preliminary or precentering marking sleeve also plays the part of driving member for the object in synchronism with the silk screen, that is to say the function of the cap 10 described in the first form of construction. To this end, the shaft 6', driven by the pinion 18 engaging with the toothed rack 19, the movements of which are coupled to those of the silk screen, is mounted directly in the bearing block 14 by means of bearings 7 and 7'. The shaft 6 is extended and passes through the cap 1' which is keyed on it by means of a key 90.

At the end of the shaft 6, a mandrel 10'a is mounted by means of bearings 13' and 13'' and by needle thrust bearings 13''', the mandrel 10'a being rigidly fixed to the sleeve 10' giving the preliminary reference mark and serving as a driving sleeve. The sleeve 10' is closed at its forward portion by a plate 10'b provided at its centre with a central boss 10'c.

In the boss 10'c is fixed a secondary shaft 6' which is in this case arranged in the extension of the shaft 6 and driving at its extremity a crank 91 carrying the pressure head 77 and mounted by means of bearings 92 on the fixed shaft 93. It will be noted that the position of the shaft 6' is determined as a function of the shape and of the size of the object.

In the mandrel 10'a is fixed a socket 94 containing a dolly 3' controlled by a spring 12'.

In the cap 1' is fixed a further socket 95, the axis of which is located on a circumference of the same radius as that passing through the axis of the socket 94.

The socket 95 comprises a recess 95a in which the dolly 3' can engage, and it contains a finger 96 pushed towards the rear of the cap by the spring 97. The front extremity of the said finger can engage in a small hollow 3'a formed in the outer end face of the dolly 3' and the rear extremity of the finger 96 can be engaged under the action of the spring 97 in a circular groove 98, the bottom of which forms a cam face, arranged in a member 99 fixed by means of screws 100 on the bearing block 14.

Finally, on a fixed portion 101 of the frame of the machine is mounted a socket 102 containing a locking finger 103 urged by a spring 104 and arranged to come into engagement with a recess 105 of the sleeve 10' when the entire object-carrier unit is brought out of the printing position, that is to say moved downwards with respect to the screen 2.

In the examples shown in Figs. 8 and 9, the sleeve 10' has been designed to serve as the driving means for receptacles 106, the bodies of which are of oval section. To this end, the plate 10'b has been given an external radius slightly smaller than the two large radii R of the oval (Fig. 10). It will be readily understood that by rotating the receptacle 106 with the said plate after having gripped it between the plate and the pressure head 77, the same object-carrier unit is constituted as described above, and it will then be possible to cause one of the outer surfaces of the receptacle included in the arcs of large radius of the oval, to roll against the silk screen and to effect the printing thereon of the design of the said screen.

The operation of the device is as follows:

It will first of all be assumed that the receptacles to be printed are brought in by two conveyor chains 107 and 107', provided with cradles 108 and 108', supporting the receptacles. The object-carrier unit constituted by the bearing block 14 and the pressure head 77, is in its bottom position and the receptacle 106 can be placed in position, either by hand or automatically, between the plate 10'b and the pressure head 77, in any known manner.

At this moment, the cam face 38b (Fig. 8) of the plate 38 is in contact with the roller 24, and the arm 28 is moved away from the shaft of the device. The belt 51

carried by the pulley 36' is moved away from the peripheral surface of the mandrel 10'a and the latter is not driven but is on the contrary locked in position by the finger 103.

Controlled by a regulating cam located in the machine, the lifting system 17 of the object-carrier unit causes the latter to move upwards.

The cam face 38b of the plate 38 moves away from the roller 24 which can then move into the hollow 38a, thus causing the arm 28 to pivot about the shaft 27 under the influence of the spring 47. The belt 51 comes into contact with the mandrel 10'a and the sleeve 10' can be driven in rotation, since the upward movement of the object-carrier unit has had the effect of freeing it from the finger 103. The pressure head 77 is driven in rotation synchronously with the sleeve 10' and follows the same trajectory as this latter while pressing the receptacle against it.

In this way, the receptacle 106 can be brought into the position shown in chain-dotted lines in Fig. 10, in which the dolly 3' becomes engaged in the recess 95a of the cap 1', which holds the sleeve 10' and the pressure head 77 stationary. The adjustment of the position of the dolly 3 is such that this immobilization is caused just before the limit of the surface intended to receive the printing has reached a point vertically above the vertical axis of the sleeve. During this first portion of the immobilization of the sleeve 10' and the pressure head 77, the driving device of the belt 51 slips by virtue of its friction lining.

But as the upward movement of the unit continues, the cam face 38c of the plate 38 comes into contact with the roller 24 and the arm 28 is again moved away. The pulley 36' and the belt 51 no longer press against the sleeve 10' and can then rotate freely to relieve the friction system of the travel-limiting device.

At the end of the upward movement of the object-carrier unit, the pinion 18 is in engagement with the toothed rack 19 at the same time as the screen 2 begins its lateral movement. The receptacle is thus put into contact with the said screen and the printing is effected over the entire surface of large radius.

The length of the fixed groove 98 is chosen in such manner that its final face corresponds to the end of the printing period (Fig. 11). At this moment, the finger 96 is pushed back by the said cam face and the latter drives the dolly 3' in its turn out of the recess 95a of the cap 1', thus disengaging the sleeve 10' and the pressure head 77 from the said cap.

The regulating cam of the machine causes the object-carrier unit to move downwards and stops the lateral motion of the screen. The hollow 38a comes into contact with the roller 24 and the belt 51 once more drives the sleeve 10' and the pressure head, thus rotating the receptacle until the latter reaches a predetermined position at which it can be removed. At this moment, the cam face 38b comes up against the roller 24 and moves the pulley 36' and the belt 51 away from the sleeve 10'.

This moment corresponds to the engagement of the locking finger 103 in the recess 105 of the sleeve 10' (Fig. 12), it being possible to obtain any other cycle of movements by suitably arranging the regulating cam of the machine.

The cycle can then again begin with a fresh receptacle. All other modifications of form and detail can be made to the devices described above without thereby departing from the spirit or from the scope of the invention.

What I claim is:

1. In a printing machine for printing on bodies of revolution by the silk-screen process, a reference-positioning device comprising: a pre-centering sleeve and a pressure-head, the object to be printed being gripped between said sleeve and head to form a sleeve-object-pressure-head unit; a reference-positioning member carried by said unit; a silk-screen printing device; a cap driven syn-

chronously with said silk-screen device; at least one reference-positioning member carried by said cap; means for bringing said unit into an angular position with respect to said cap such that printing can be effected, by virtue of the interposition of said reference-positioning device, from a predetermined point of origin on said object, said device comprising an individual motor, a belt and a pulley for driving said unit in rotation, a reduction gear and a torque-limiting device interposed in said drive; a pivoted arm carrying said pulley and adapted to bring said pulley either into or out of engagement with any one member of said unit; a lifting device for bringing the surface of said object into contact with or out of engagement with said silk screen, said lifting device also actuating said pivoted arm; and a regulating cam in said machine for controlling in synchronism the movements of said lifting device and said silk screen.

2. A reference-positioning device as claimed in claim 1, and further comprising a machine frame; a pivot shaft supporting said pivoted arm; a support for said lifting device; fixing means for securing said pivot shaft in said support; a cam-face formed on said pivoted arm; a roller mounted in fixed position on said machine frame and cooperating with said cam-face so as to move said pulley away from said unit when said arm moves upwards at the same time as said unit, in order that the pulley may first drive said unit in rotation until the reference-positioning member of said unit engages with the corresponding reference-positioning member on said cap, the pulley being then stopped due to the immobilization of said unit by engagement of said reference-positioning members, thereby causing said torque-limiting device to slip until said cam-face and fixed roller move said pulley away from said unit, the pulley being then freed to rotate.

3. A reference-positioning device as claimed in claim 2, in which the cam-face formed on said arm is adjustable in position so as to correspond to the dimensions of the objects to be printed.

4. A reference-positioning device as claimed in claim 1, in which said pulley-carrying pivoted arm has an extension at its lower portion; an adjustable spring acting on said extension and intended to apply said pulley against one of the members of said unit in order to drive said unit in rotation.

5. A reference-positioning device as claimed in claim 4, in which the surface of engagement between said pulley and the co-operating member of said unit is provided with a friction lining.

6. A reference-positioning device as claimed in claim 1, and further comprising an adjustable stop member carried by said lifting device to limit the amplitude of pivotal movement of said arm, said stop acting on the extremity of the extension of said arm.

7. A reference-positioning device as claimed in claim 1, and further comprising a pivoted cradle intended to maintain the tension of the belt coupling said reducing gear to said pulley; means for mounting said motor and said reduction gear in said cradle; and adjustable stop means for limiting the pivotal travel of said cradle, and thereby limiting the effort applied to the shaft of said pulley.

8. A reference-positioning device as claimed in claim 4, and further comprising means for pivoting said extension about the pivotal axis of said arm; and a curved slot formed in said extension, co-operating with a screw fixed in said arm, whereby said extension forms an adjustable angle with said arm, said angle depending on the diameter of the object to be printed.

9. A reference-positioning device as claimed in claim 1, and further comprising an elastic ring fixed on said pulley and intended for engagement with the driven member of said unit.

10. A reference-positioning device as claimed in claim 1, in which the drive of said unit by said pulley is effected by the outer face of the driving belt passing over said pulley, said belt face engaging in direct contact with the driven member of said unit.

11. A reference-positioning device as claimed in claim 1, in which said reference-positioning member carried by said cap is a nipple or dolly retractable into said cap, and said reference-positioning member carried by said unit is a recess formed in the bottom of the object to be printed, said pre-centering sleeve rotating freely round said cap when driven by said pulley, and the front edge of said sleeve extending beyond the periphery of said cap so as to engage and drive said object until said dolly is engaged in said recess.

12. A reference-positioning device as claimed in claim 11, in which said nipple is mounted in a housing formed in said cap, and is subjected to the action of a spring located in said housing.

13. A reference-positioning device as claimed in claim 1, in which said pre-centering sleeve rotates freely round said cap driven in synchronism with said silk screen; plate means for closing said cap; a secondary shaft fast with said plate means; a crank fixed on the free extremity of said secondary shaft; means for fixing said pressure-head on said crank so as to drive said head in synchronous rotation with said sleeve; a retractable dolly mounted towards the rear of said plate and intended to engage in a recess formed in said cap; a fixed cam-face and an ejector finger actuated by said cam-face and passing through said recess in order to permit disengagement of said sleeve from said cap by pushing back the dolly at a point in the cycle of synchronous rotation of said sleeve and cap; and a locking finger for immobilizing said sleeve and said pressure-head after the object has been printed.

14. A reference-positioning device as claimed in claim 1, in which said cap and said sleeve for driving the object to be printed are removable and replaceable by caps and sleeves of different diameters, corresponding to the dimensions of said objects to be printed.

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