

Nov. 23, 1954

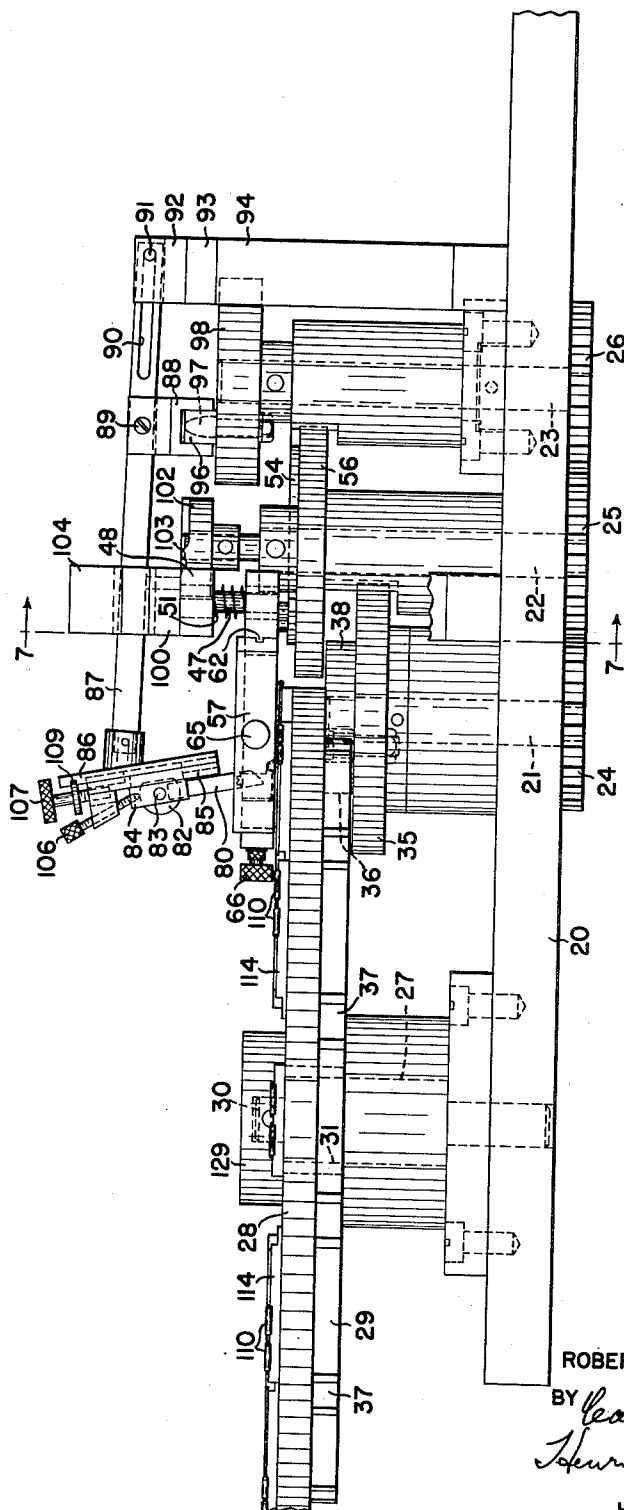
R. J. SHOEMAKER
SILK SCREEN MACHINE

2,694,973

Filed July 26, 1952

4 Sheets-Sheet 2

FIG. 2



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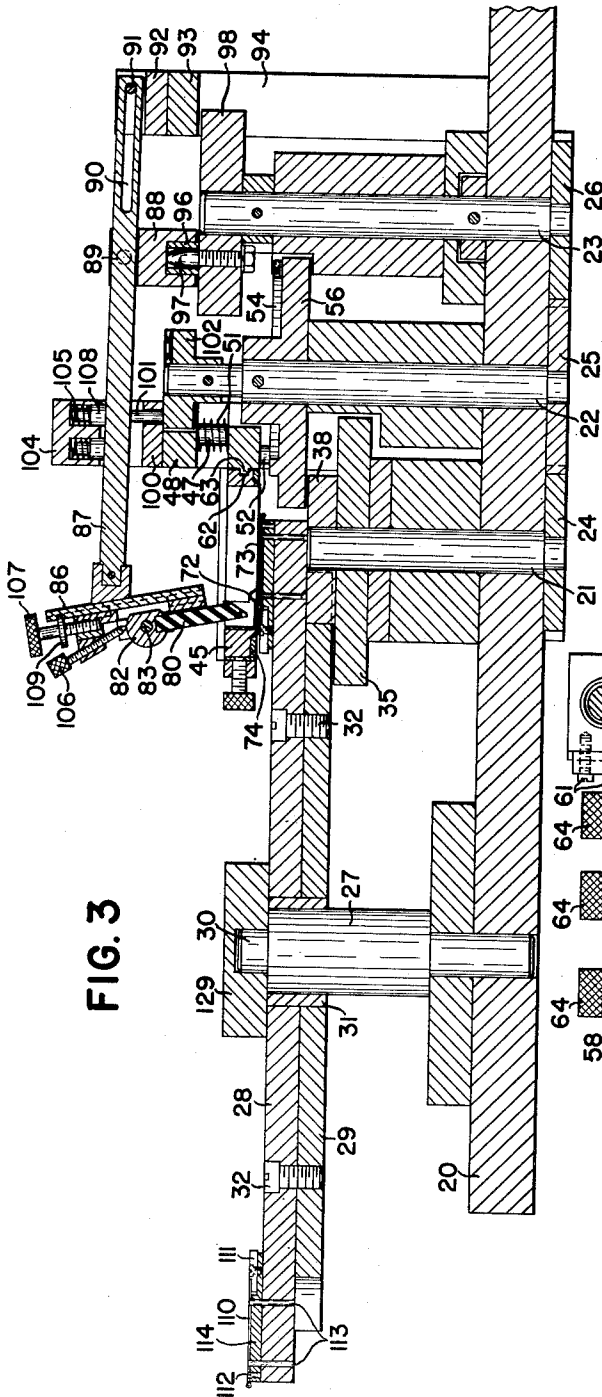


FIG. 3

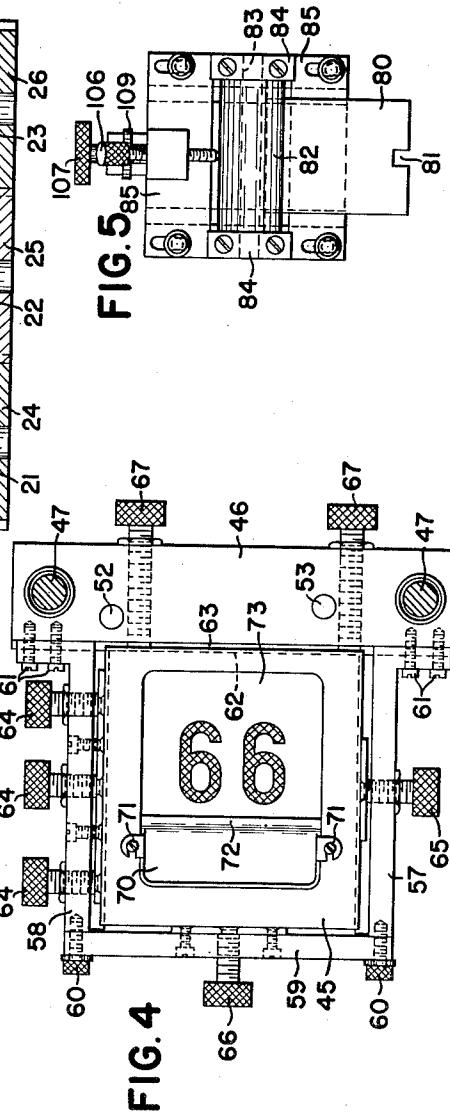


FIG. 4

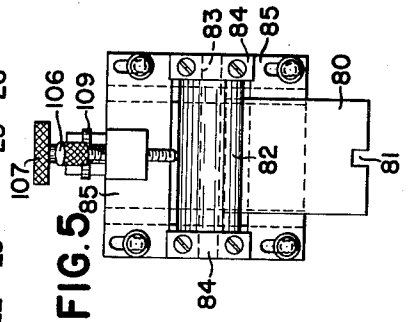


FIG. 5

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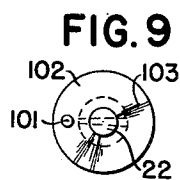
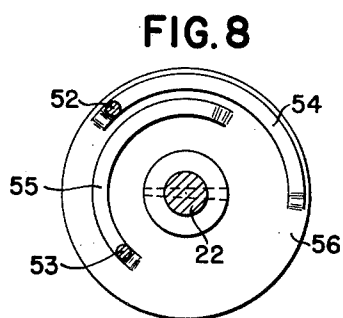
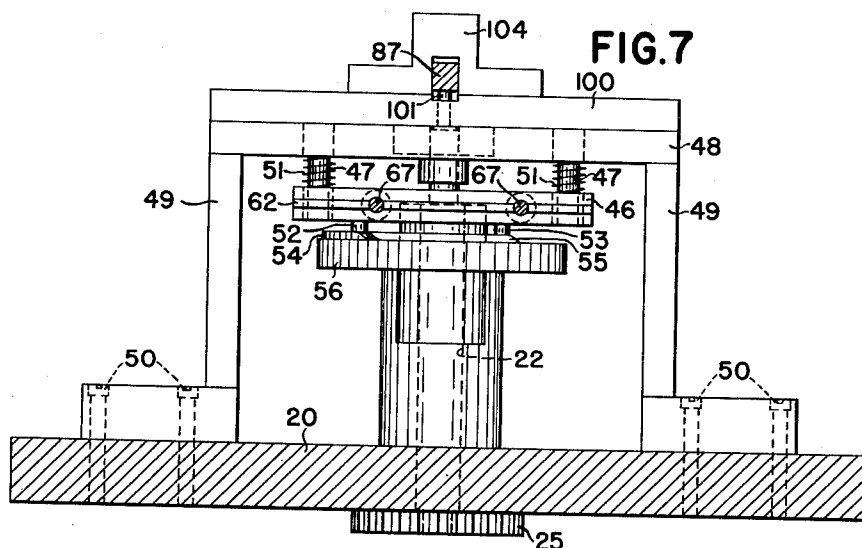
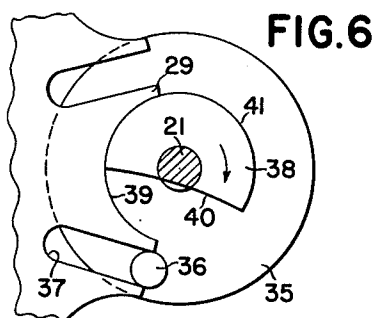
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2,694,973

SILK SCREEN MACHINE

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Application July 26, 1952, Serial No. 301,017

3 Claims. (Cl. 101—126)

This invention relates to a semi-automatic machine for carrying out a silk screen process.

An object of the invention is to provide a semi-automatic machine which includes an indexing table on which blank articles are fed to a silk screen, where a squeegee is automatically passed over the screen to provide a silk screen impression on the article.

A specific object of the invention is to provide a turntable on which flat articles are positioned by an operator and which is automatically turned to position the article beneath a silk screen, where a squeegee supplied with ink passes over the silk screen to make an impression on the article, whereupon the table is indexed to position a new blank beneath the screen, and the printed article is moved to a station where an operator can remove it.

A specific object of the invention is to provide a mechanism for operating a squeegee over a silk screen and to provide an ink well into which the squeegee is dipped prior to the silk screen operation.

Another specific object of the invention is to provide means for adjusting the squeegee so that the proper contact can be maintained between the silk screen and the squeegee.

Another specific object of the invention is to provide mechanism for automatically oscillating a squeegee, and a means for holding the squeegee out of contact with the silk screen while the squeegee is moving in one direction and to lower the squeegee into contact with the silk screen during its return movement.

With these and incidental objects in view, the invention includes certain novel features of construction and combinations of parts, a preferred form or embodiment of which will be hereinafter described with reference to the drawings which accompany and form a part of this specification.

Of said drawings:

Fig. 1 is a top plan view of the silk screen machine.

Fig. 2 is a side elevation of the machine shown in Fig. 1.

Fig. 3 is a cross section taken on the line 3—3 in Fig. 1, looking in the direction of the arrows.

Fig. 4 is a top plan view of the frame for mounting the silk screen.

Fig. 5 is an elevational view showing the squeegee and the manner of adjusting it.

Fig. 6 is a detail top plan view of the Geneva gear operating mechanism for turning the indexing table.

Fig. 7 is an elevational view, partly in cross section, taken on line 7—7 of Fig. 2.

Fig. 8 is a detail plan view showing the cam for actuating the silk screen supporting frame.

Fig. 9 is a detail plan view showing the cam for raising and lowering the squeegee.

General description

The machine illustrated herein is a mechanism for performing silk screen operations which have heretofore been done by hand. In the prior process, the silk screen is manually positioned over the articles to be printed, and the squeegee is manually passed over the silk screen to make a printed impression by hand. Hand-operated silk screening, while very satisfactory, has the drawback of non-uniform results. When a silk screen process is used for producing large numbers of articles, the hand method results in a high percentage of rejects when the article is to be used in an environment requiring extreme accuracy. The present machine includes an indexing table

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on which the articles to be printed upon are positioned by an operator, and the table is indexed intermittently to position the article below the silk screen. In the present embodiment, two articles are printed during one stroke of the squeegee. A Geneva gear operating mechanism is used to obtain the intermittent operation of the indexing table, which mechanism provides a rest in the rotation of the indexing table long enough to perform the silk screen operation. The squeegee is mounted on a reciprocating bar which is controlled to be dipped into a well of ink and raised out of the well and then moved into its operating position. During the return stroke of the squeegee, the squeegee is in lowered position in proper engagement with the silk screen to force the ink through the screen to make the printed impression on the articles below the screen. As the squeegee approaches the end of its movement, it is raised over a dam and thereafter lowered into the well to dip fresh ink from the well for the next cycle of operation. During the return stroke of the squeegee while it is not engaged with the screen, the table is indexed to feed the printed articles from beneath the screen and to position new blank articles therebelow. Before the indexing operation begins, a mechanism operates to raise the screen out of contact with the articles, and, after the indexing table comes to rest in the printing position, the screen is again automatically lowered into proper contact with the article to be printed.

Detailed description

The mechanism is mounted on a table 20, which may be mounted on any desired standard. Mounted in suitable bearings in the plate 20 are three drive shafts, 21, 22, and 23. Secured to the lower end of said drive shafts, adjacent the under side of the plate 20, are gears 24, 25, and 26, respectively. The diameters of the gears 24, 25, and 26 are alike, so that, during each cycle of a machine operation, each of the shafts 21, 22, and 23 receives one complete rotation. A suitable power mechanism, such as an electric motor, provided with a pinion, may be in mesh with any one of the three gears 24, 25, or 26, through which the mechanism comprising the shafts 21, 22, and 23 is driven.

Also supported in a suitable bearing in the plate 20 is a stud 27, on which the index turntable 28 is mounted for rotation. A bearing 129 is mounted on the upper face of the index turntable 28 and is provided with a recess into which a stub 30 on the upper end of the stud 27 is mounted. A bushing 31 provides a bearing for turning the indexing table 28 on the shaft 27.

Mounted beneath the turntable 28 is a Geneva gear 29. The Geneva gear 29 is secured to the turntable 28 by suitable screws 32.

Mounted on the upper end of the shaft 21 is a disc 35 (Figs. 2, 3, and 6), on which is provided a stud 36 for actuating the Geneva gear 29. When the disc 35 is rotated clockwise (Fig. 6), the stud 36 enters a notch 37 in the Geneva gear to rotate the latter, and, when the turntable 28 has moved to position the article beneath the silk screen, the stud 36 moves out of the notch 37. A locking disc 38, engaging a surface 39 of the Geneva gear, normally locks the Geneva gear and the turntable in fixed position. A notch 40 in the disc 38 provides clearance for the Geneva gear, and the outer periphery 41 of the locking disc 38 locks the Geneva gear while the locking disc is rotated to bring the stud 36 into engagement with the next notch 37.

A silk screen frame 45 (Figs. 3 and 4), later described in detail, is adjustably mounted on a floating bar 46 (see also Fig. 7). The floating bar 46 is guided in its up-and-down movements by two pilot studs 47, carried by a cross bar 48, supported on two standards 49, secured to the plate 20 by any convenient means, such as the screws 50 (Fig. 1). The pilot studs 47 project downwardly into guide holes in the floating bar 46. A spring 51 surrounds each pilot stud 47 to maintain a pair of cam pins 52 and 53 (see also Fig. 8) in engagement with cams 54 and 55, respectively, formed on a cam disc 56, which control the extent and timing of the up-and-down movements of the floating bar 46. The cam disc 56 is

pinned to the shaft 22 and is rotated one complete rotation for each machine cycle.

The floating bar 46 has secured thereto a frame for removably receiving the silk screen frame 45 and comprises two angle side pieces 57 and 58 (Fig. 4), connected by a front piece 59. The frame comprising the pieces 57, 58, and 59 is secured together by screws 60 and to the floating bar 46 by screws 61, so that this frame moves up and down with the floating bar 46.

The right-hand wall (Figs. 3 and 4) of the silk screen frame 45 is provided with a groove 62, which slides on a rail 63 formed on the floating frame 46, so that the silk screen frame may be adjusted laterally thereon, to properly align the silk screen with the article to be printed upon. The silk screen frame 45 is held in proper alignment on the rail 63 by set screws 64 and 65, which pass through and are threaded in the pieces 58 and 57, respectively, of the silk screen frame supporting assembly. A further set screw 66 holds the silk screen frame in engagement with the rail 63, and set screws 67, threaded in the floating bar 46, provide a means for limiting the adjustment of the frame on the rail 63 and form an abutment for the silk screen when the set screw 66 is tightened thereagainst.

The invention is illustrated herein for printing target indicators such as those shown in the United States Patent to Frederick L. Fuller, No. 1,163,748, issued December 14, 1915. As disclosed in said patent, indicator targets having various characters thereon are used in cash registers and accounting machines, and a large number of such duplicate targets are in use. The invention provides a novel means to facilitate the printing of such targets and to produce the targets with a minimum of rejects due to improper alignment and other imperfections that are inherent in hand silk screen operations. As illustrated herein, two targets are printed during the same machine cycle, and the silk screen stencil, as illustrated in Fig. 4, is cut to print two targets. The accuracy and alignment of the printing on the targets is important in cash registers and accounting machines, in that, when the targets are in use in the machine, they must be in perfect alignment for the sake of good appearance. The set screws 64, 65, 66, and 67 permit the adjustment of the silk screen to get the proper registration. After a sample target has been screened, a gauge is provided to determine whether or not the silk screen frame 45 is in proper alignment, and adjustments can be made by use of these set screws and according to the requirements.

A well 70 is removably mounted on the silk screen frame 45 by means of screws 71 engaging ears on the well 70. A dam 72 prevents the ink from flowing out of the well to the screen. The silk screen 73 is stretched on the silk screen frame 45 by means of a four-sided frame 74, which fits into recesses in the silk screen frame 45, as shown in Fig. 3.

The up-and-down movements of the frame 45 are controlled by the cams 54 and 55, which engage the aforementioned cam pins 53 and 54, respectively. When the cam plate 56 is rotated, the cam rails 54 and 55, engaging the cam pins 52, raise and lower the silk screen frame 45 at the proper times.

A rubber squeegee 80 (Figs. 3 and 5) is provided for wiping over the silk screen. Inasmuch as two characters are printed at the same time on two individual targets, the squeegee 80 is divided into two sections by cutting a notch 81 in its center, as clearly illustrated in Fig. 5. Each section of the unnotched portion of the lower end of the squeegee is wide enough to wipe over the stencil of each target. The squeegee 80 is supported in a bearing 82, which is pivotally mounted on a short shaft 83, carried by two bearings 84. The bearings 84 are mounted on a sliding frame comprising the two plates 85 (Fig. 5), which in turn are adjustably mounted on a plate 86 connected to an oscillating rod 87, connected to a connecting rod 88 by set screws 89, or in any other desired manner. The right-hand end of the oscillating rod 87 is provided with a slot 90, sliding on a stud 91, carried by a bar 92, supported on the cross bar 93 of two standards 94. The standards 94 are supported on the table 20 by means of screws 95 (Fig. 1).

The bar 93 is slotted to receive a bar 96, having a hole to receive a formed pin 97, carried by a plate 98. A plate 98 is secured to the upper end of the shaft 23. A cross bar 100 is mounted on the cross bar 48 and is provided with an opening in which a cam pin 101 loosely

fits. The oscillating rod 87 normally rests on the top of the cam pin 101, and the latter rests on a cam 102 (see also Fig. 9), secured to the upper end of the shaft 22. The cam disc 102 is provided with a cam rail 103, which controls the extent and timing of the up-and-down movement of the oscillating rod 87 and through said rod controls the up-and-down movements of the squeegee 80. Spring-pressed studs 108, carried in a housing 104, maintain the oscillating rod 87 in constant contact with the cam pins 101. The housing 104 is mounted on the cross bar 100. Springs 105, engaging shoulders on the studs 103, maintain the under side of the oscillating rod 87 in engagement with the top of the cam pin 101 and the latter in engagement with the cam plate 102.

A set screw 106 is provided to maintain the bearing 82 and, therefore, the squeegee 80 in the proper angular set position to provide a fine adjustment for the squeegee in respect to the position in which the squeegee engages in the ink well and also with the silk screen just prior to the printing operation. An adjusting screw 107, having a collar 109, engaging a notch in the plate 86, provides a means for adjusting the frame holding the squeegee up and down on the bar 86, so that the proper pressure can be maintained on the silk screen during the printing operation.

The targets 110 are positioned on the index table and are accurately spaced thereon by locating blocks 111 and by locating pins 112. As illustrated in the Fuller patent, the targets 110 are notched at one end to fit over the blocks 111 and are provided with shoulders which engage the locating pins 112. After the targets are placed in position, they are so held by permanent magnets 115, which hold the targets 110 flat against the station block 114. The station blocks 114 are suitably secured in their proper location by screws 115.

As illustrated herein, the index table is provided with twelve stations. The invention is not limited to an indexing plate of twelve stations, since either more or less stations can be provided, depending upon the work to be printed and the speed at which the machine is to be operated. Therefore, the twelve stations illustrated herein are merely for the purpose of disclosing the invention.

Operation

The sequence of operations of the machine is as follows, assuming that the machine starts from the position illustrated in the drawings, which position is when the stud 36 of the Geneva drive mechanism is just about to enter the slot 37 in the Geneva gear 29. At this stage of the cycle of operation, the squeegee 80 is in its left-hand position (Fig. 3) and in the position in which it has been raised out of the ink well and is about to be returned into its operating position. Also, at this time, the silk screen frame 45 is in a raised position, so that, upon operation of the Geneva gear 28, the screen will be out of contact therewith. Let it be assumed that the blank targets are on the index plate and the index table begins to move. While the index table is moving into its new position, the pin 97, being rotated by the plate 98, moves the oscillating rod 87 toward the right (Fig. 3) to position the squeegee in the right-hand end of the frame. By the time the squeegee 80 reaches its right-hand position, the silk screen frame will have been lowered by the cams 53 and 54, and the cam 102 lowers the squeegee into contact with the silk screen. Thereupon the squeegee is moved forward toward the position illustrated in Fig. 3 by the pin 97 on the cam plate 98, which cam plate makes one complete revolution as the squeegee 80 reaches its right-hand position, the silk screen frame will have been lowered by the cams 53 and 54, and the cam 102 lowers the squeegee into contact with the silk screen. Thereupon the squeegee is moved forward toward the position illustrated in Fig. 3 by the pin 97 on the cam plate 98, which cam plate makes one complete rotation for each cycle of operation of the machine, during which the connecting rod is moved back and forth. Just before the squeegee reaches the dam 72, the cam 102, acting on the pin 101, raises the oscillating rod 87, causing it to pivot on the stud 91 and raise the squeegee so that it can pass over the dam. Immediately after the squeegee passes over the dam 72, the cam 102 again permits the springs 105, acting on the cam pin 101, to lower the squeegee into the well to dip the squeegee into the ink and immediately raise the squeegee out of the well and into the position shown in Fig. 3, whereupon the mechanism will be in position for another cycle of operation.

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The cycles of operation are continuous. An operator inserts blanks on the indexing stations of the index plate 28 just before the blanks move beneath the screen, and, as the printed targets move out from under the screen, another operator removes the printed targets and positions them in drying racks.

By providing the fine adjustments for the silk screen frame 45 and for the squeegee 80, the machine will silk-screen the targets so efficiently that only a very few rejects are found. In addition to the reduced number of rejects that are found as compared with the hand method, the machine can silk-screen as many targets as seven operators normally produce by hand. Therefore, the machine is adapted not only for better silk screen work but also for a greater production per man hour.

While the form of mechanism shown and described herein is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form or embodiment disclosed herein, for it is susceptible of embodiment in various other forms.

What is claimed is:

1. In a machine of the class described, the combination of an intermittently rotatable indexing table; a plurality of stations on the table for receiving articles on which characters are to be stenciled by the silk screen process; a silk screen; a silk screen frame for supporting the silk screen; a squeegee for performing the silk screen stenciling process; a float support for the silk screen frame; a reservoir of ink in the frame; an actuating means to actuate the squeegee to dip the squeegee into the reservoir and thereafter raise the squeegee out of the reservoir; oscillating means to move the squeegee into a retracted position after the squeegee has been raised out of the reservoir; and means to lower the squeegee into contact with the silk screen, said oscillating means thereafter operable to move the squeegee across the surface of the silk screen to perform the silk screen stenciling operation.

2. In a machine of the class described, the combination of a silk screen frame; a table for receiving articles on which characters are to be stenciled by the silk screen process; a silk screen; a frame for supporting the silk

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screen; a floating support for the frame; a squeegee; a reservoir of ink; an oscillating member on which the squeegee is carried; actuating means to lower the oscillating member when the squeegee is opposite the ink reservoir to dip the squeegee into the ink and to raise the squeegee out of the reservoir after being dipped into the ink; and operating means to retract the oscillating member after the squeegee has been raised, said actuating means thereafter lowering the squeegee into contact with the silk screen, said operating means adapted to move the squeegee across the silk screen to stencil a character on the article below the screen.

3. In a machine of the class described, the combination of a silk screen frame; a table for receiving articles on which characters are to be stenciled by the silk screen process; a silk screen; a frame for supporting the silk screen; a floating support for the frame; a squeegee; a reservoir of ink; an oscillating member; an adjustable slide on the oscillating member; a bearing on the slide to support the squeegee; an adjusting screw to adjust the slide on the oscillating member, whereby the squeegee is adjusted in relation to the silk screen; actuating means to lower the oscillating member when the squeegee is opposite the ink reservoir to dip the squeegee into the ink and to raise the squeegee out of the reservoir after being dipped into the ink; and operating means to retract the oscillating member after the squeegee has been raised, said actuating means thereafter lowering the squeegee into contact with the silk screen, said operating means adapted to move the squeegee across the silk screen to stencil a character on the article below the screen.

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