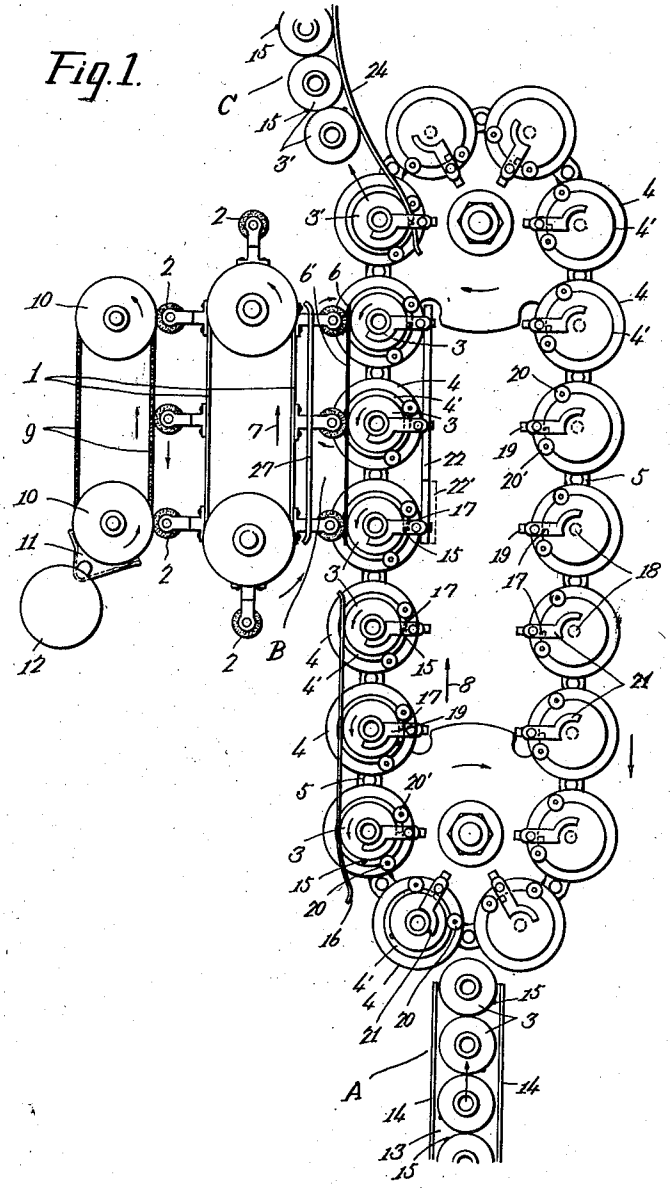
Oct. 23, 1956 ICHIRO HAKOGI 2,767,647

PROCESS OF AND AN APPARATUS FOR SILK SCREEN PRINTING ON CURVED SURFACES ON A CYLINDRICAL ARTICLE

Filed Oct. 7, 1952

2 Sheets-Sheet 1

Fig. 1.




Inventor:

ICHIRO HAKOGI

By

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Fig. 2.

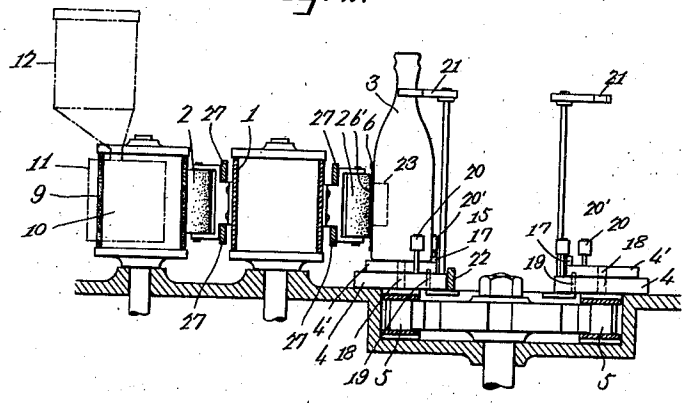
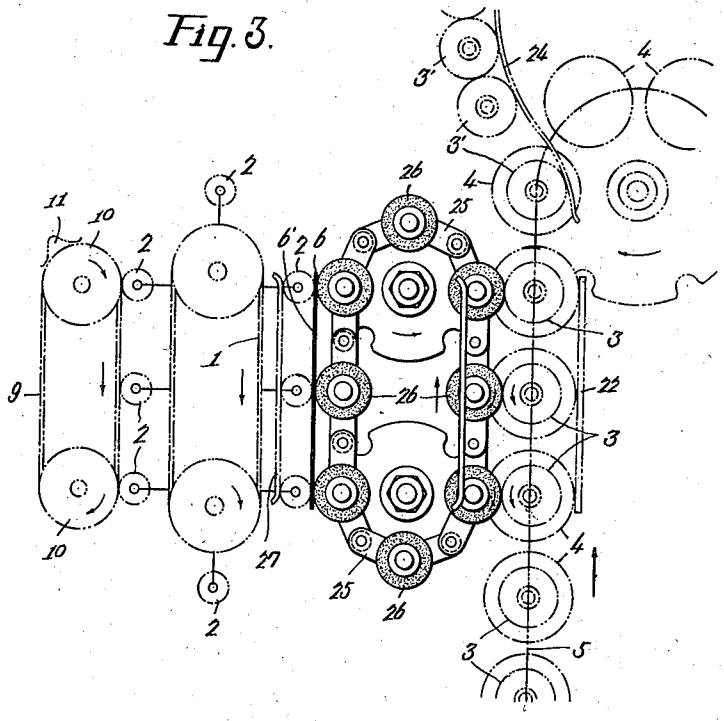



Fig. 3.




Inventor:

ICHIRO HAKOGI

By Michael S. Hu
Agt

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# PROCESS OF AND AN APPARATUS FOR SILK SCREEN PRINTING ON CURVED SURFACES OF A CYLINDRICAL ARTICLE

Ichiro Hakogi, Setagaya-ku, Tokyo, Japan

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7 Claims. (Cl. 101—126)

This invention relates to a process and apparatus for automatic silk screen printing on curved surfaces of cylindrical articles such as bottles or the like. Significant features of this invention are the provision of an endless chain for carrying cylindrical articles thereon and an endless printing belt adjacent said endless chain, the former having discs at suitable intervals, these discs each carrying an article to be printed upon, and the latter having rollers or squeezers provided at equal intervals to those of the discs on the endless chain.

More particularly the present invention relates to an apparatus comprising conveyer means for carrying a plurality of cylindrical articles in a substantially vertical position in succession past a printing station, means operatively connected to the conveyer means for freeing the articles for rotation about their axes as they move by the printing station, and printing means located at the station for printing articles as they move by the station, the printing means including a vertical silk screen located beside and being spaced from the conveyor means at the printing station, a plurality of offset printing rollers, and second conveyer means carrying the offset printing rollers for moving the same along the silk screen and from the latter along a path located over and closely adjacent to the first-mentioned conveyer means at the printing station so that the articles respectively come into contact with the offset printing rollers and rotate freely by frictional engagement therewith during movement by the printing station.

The details and objects of this invention will be described with reference to the accompanying drawings, in which Fig. 1 is a plan view of an embodiment of this invention, Fig. 2 is a sectional elevation of the most significant part of the embodiment shown in Fig. 1 and Fig. 3 is a plan view of a modified embodiment of the invention in which an offset printing device is applied between the printing belt and the endless chain.

Now, referring to Fig. 1, **1** is an endless belt upon which a series of inking rollers **2** are provided at suitable intervals. Adjacent to said endless belt **1**, there is provided an endless chain **5** which has a series of discs **4** for carrying cylindrical articles to be printed upon such as bottles **3**. At a predetermined position, a frame **6**, which is fitted with a silk screen **6'** is located between the endless chain **5** and the endless belt **1**. The endless chain **5** and belt **1** are rotated at the same peripheral speed in the directions shown by arrows **7**, **8**, by a motive source not shown. On the opposite side to the endless chain **5**, there is provided an endless inking pad **9** which is rotated by two rotating drums **10**, **10**, the pad **9** being supplied with ink from an ink tank **12** through the reservoir **11**.

Cylindrical articles to be printed upon are fed from the feeder A and are printed upon in zone B. After passing through the printing zone, the articles are sent to the delivery zone. C. From the feeding zone A, where a belt conveyer **13** which has two walls **14**, **14** is provided, bottles **3** are transferred in a vertical position to the holding discs **4'** located respectively on the discs **4**. The bottles **3** on the holding discs **4'** are carried in contact with the guide plate **16** the friction between each bottle and the guide plate causing the bottle to rotate on the holding disc **4'** to such a position that a boss **15**, provided near the bottom of each bottle is engaged by a registration means **17** which is provided on the holding discs **4'** for registering the bottle for printing. The holding disc **4'** is connected to the lower disc **4** by a shaft **18** and normally they rotate together when fixed by a pin **19**. However, when a bottle **3** is put into position for printing, the engagement of the pin **19** is released by a pressing plate **22'** (described hereinafter) resulting in the holding disk **4'** with a bottle **3** thereon being able to rotate freely with respect to the lower disk **4**. The bottle **3** is prevented from falling down by being firmly held by the holding rollers **20**, **20'** and the supporter **21** which are provided on the lower disc **4**. In this manner, the bottles are put in order for undergoing printing at the printing zone B. The printing is carried out by the printing roller **2** on the curved surface of a bottle **3** through the silk screen **6'** while the endless belt **1** and the endless chain **5** are rotating at the same peripheral speed. For undergoing printing, the non-rotatable engagement between the holding disc **4'** and the lower disc **4** is released by lowering the pin **19**, the bottle **3** rotating together with the disc **4'** due to the engagement of the boss **15** with the registration means **17**. During this operation, the bottle is firmly held by the holding rollers **20**, **20'** and the suporter **21**, but as soon as the printing is over, the rotation of the bottle stops and the engagement between the holding disc **4'** and the lower disc **4** is resumed with the return of the pin **19** to its engaging position. During the printing operation, the endless belt **1** and the endless chain **5** are pressed towards each other by the press guides **27**, **22**, in order to obtain correct and clear printing. The fore part **22'** of the press guide **22** is so constructed (as shown by dotted lines in Fig. 1) as to move back and forth. In its normal position, part **22'** is held to the right, as viewed in Fig. 1, but is used to press the lower disc **4** against the silk screen at the beginning of printing. These press guides **22**, **22'** control the movement of the pin **19** which is used for controllably engaging the holding disc **4'** with the lower disc **4**. Thus, the bottles **3** which have been printed upon as desired are carried out of the printing zone B to the delivery zone C. Fig. 3 shows an embodiment of this invention wherein an offset printing device is applied between the silk screen **6'** and the endless chain **5**. An endless chain **25** which is provided with a series of offset rollers **26** at the same intervals as that of the printing rollers **2** of the chain belt **1**, that is to say, at the same intervals as the bottles to be printed on the endless chain **5**. In this manner, a preliminary print is first obtained through the silk screen onto each offset roller **26** and this print on the offset roller is in turn transferred to a bottle to be printed upon an endless chain **5**. In this manner, a print of better appearance is obtained on each bottle inasmuch as the print of the screen tecture in the case of a direct print, is prevented.

The other devices such as the feeder, delivery means and ink supplying means, are identical to those in the first-mentioned embodiment.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of printing apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in printing apparatus for printing on bottles, it is not intended to be limited to the details shown, since various modifications and structural changes may be made

without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Apparatus for printing cylindrical articles, comprising, in combination, conveyer means for carrying a plurality of cylindrical articles in a substantially vertical position in succession past a printing station; means operatively connected to said conveyer means for freeing the articles for rotation about their axes as they move by said printing station; and printing means located at said station for printing articles as they move by said station, said printing means including a vertical silk screen located beside and being spaced from said conveyer means at said printing station, a plurality of offset printing rollers, and second conveyer means carrying said offset printing rollers for moving the same along said silk screen and from the latter along a path located over and closely adjacent to said first-mentioned conveyer means at said printing station so that the articles respectively come into contact with said offset printing rollers and rotate freely by frictional engagement therewith during movement by said printing station.

2. Apparatus for printing cylindrical articles, comprising, in combination, printing means located at a printing station for printing articles as they move by said station; and conveyer means for carrying a plurality of cylindrical articles in a substantially vertical position in succession past said printing station, said conveyer means comprising an elongated flexible support located in a horizontal plane, means for moving said support in the direction of its length, a plurality of plates also located in a horizontal plane, being carried by said support at the top side thereof, and being distributed along said support, a plurality of discs turnably carried by said plates, respectively, at the top faces thereof, and releasable lock means carried by each plate for releasably locking the disc thereon to said plate; and release means located at said printing station for releasing said discs from said plates, respectively, at said printing station so that said discs are free to rotate on said plates, respectively, when said discs are located at said printing station.

3. Apparatus for printing cylindrical articles, comprising, in combination, printing means located at a printing station for printing articles as they move by said station; and conveyer means for carrying a plurality of cylindrical articles in a substantially vertical position in succession past said printing station, said conveyer means comprising an elongated flexible support located in a horizontal plane, means for moving said support in the direction of its length, a plurality of plates also located in a horizontal plane, being carried by said support at the top side thereof, and being distributed along said support, a plurality of discs turnably carried by said plates, respectively, at the top faces thereof, and releasable lock means carried by each plate for releasably locking the disc thereon to said plate; and release means located at said printing station for releasing said discs from said plates, respectively, at said printing station so that said discs are free to rotate on said plates, respectively, when said discs are located at said printing station, each of said discs having a projection adapted to be engaged by a boss of the article to be printed so that the latter rotates together with the disc carrying the same upon frictional engagement between the article and said printing means.

4. Apparatus for printing cylindrical articles, comprising, in combination, printing means located at a printing station for printing articles as they move by said station; and conveyer means for carrying a plurality of cylindrical articles in a substantially vertical position in succession past said printing station, said conveyer means comprising an elongated flexible support located in a horizontal plane, means for moving said support in the direction of its length, a plurality of plates also located in a horizontal plane, being carried by said support at the top side thereof, and being distributed along said support, a plurality of discs turnably carried by said plates, respectively, at the top faces thereof, and releasable lock means carried by each plate for releasably locking the disc thereon to said plate; release means located at said printing station for releasing said discs from said plates, respectively, at said printing station so that said discs are free to rotate on said plates, respectively, when said discs are located at said printing station, each of said discs having a projection adapted to be engaged by a boss of the article to be printed so that the latter rotates together with the disc carrying the same upon frictional engagement between the article and said printing means; and bar means located along said conveyer means before said printing station for frictionally engaging the articles to be printed to turn the latter on said discs until the bosses of the articles to be printed respectively engage said projections of said discs.

5. Apparatus for printing cylindrical articles, comprising, in combination, conveyer means for carrying a plurality of cylindrical articles in a substantially vertical position in succession past a printing station; printing means located at said station for printing said articles as they move by said station, said printing means comprising a vertical silk screen located at said station over and closely adjacent to said conveyer means for contacting the articles to be printed, a plurality of inking rollers for applying ink to said silk screen, second conveyer means for carrying said inking rollers in succession along one face of said silk screen, and means for supplying ink to said rollers before said second conveyer means applies the same to said silk screen and means freeing the articles to be printed for respective rotation about vertical axes by frictional contact with said screen during printing of the articles, so that both the inking rollers and the articles printed have rolling contact with said screen.

6. Apparatus for printing cylindrical articles, comprising, in combination, conveyer means for carrying a plurality of cylindrical articles in a substantially vertical position in succession past a printing station; and printing means located at said station for printing said articles as they move by said station, said printing means comprising a vertical silk screen located at said station over and closely adjacent to said conveyer means for contacting the articles to be printed, a plurality of inking rollers for applying ink to said silk screen, second conveyer means for carrying said inking rollers in succession along one face of said silk screen, and means for supplying ink to said rollers before said second conveyer means applies the same to said silk screen, said ink supplying means comprising an endless absorbent belt located along a part of the path through which said rollers move to contact said rollers, means for moving said belt, and an ink reservoir communicating with a part of said belt so that as the latter moves it absorbs ink from said reservoir and applies ink to said rollers which in turn apply ink to said silk screen.

7. Apparatus for printing cylindrical articles, comprising, in combination, printing means located at a printing station for printing articles as they move by said station; conveyer means for carrying a plurality of cylindrical articles in a substantially vertical position in succession past said printing station, said conveyer means comprising an elongated flexible support located in a horizontal plane, means for moving said support in the direction of its length, a plurality of plates also located in a horizontal plane, being carried by said support at the top side thereof, and being distributed along said support, a plurality

of discs turnably carried by said plates, respectively, at the top faces thereof, and releasable lock means carried by each plate for releasably locking the disc thereon to said plate, rollers carried by each plate and located at a higher elevation than the disc thereon for engaging an article on said disc to stabilize the same, and a member carried by each plate and located above the disc on said plate at a higher elevation than said rollers for further increasing the stability of an article on said disc; and release means located at said printing station for releasing said discs from said plates, respectively, at said printing station so that said discs are free to rotate on said plates,



respectively, when said discs are located at said printing station.

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