Title: IMPROVING THE PERFORMANCE OF DOUBLE FORMER HOLDER CONFIGURATION IN HIGH SPEED LATEX DIPPING PROCESS

Abstract: The present invention describes an improved double former holder assembly that is used in high speed latex dipping process for the production of products such as medical gloves. The double former holder assembly (1) basically consists of a U-shaped bracket (12), which is connected to two taper-L-shaped arms (13A, 13B) having an upright plate (14) and a rectangular base plate (15). The U-shaped bracket (12) has a base (16) and two vertical ends (17) and a pivotal rod (18). Each of the rectangular base plate (15) of the two taper-L-shaped arms is used to hold at least on former holder (20). In the closed position (22) the two L-shaped arms and the former holders can have an arcuate motion of up to 150°.
IMPROVING THE PERFORMANCE OF DOUBLE FORMER HOLDER CONFIGURATION IN HIGH SPEED LATEX DIPPING PROCESS

The present invention relates to an assembly of double former holders for dip coating mandrels/formers to form latex products such as medical gloves. More particularly, this invention relates to an improvement in the double former holders configuration for continuously conveying two or more formers which are in various shapes depending on the types of latex products that are produced. In the case of latex gloves, the formers are in the shape of a hand. Specifically, double former holders configuration constructed according to this invention is disclosed. They are used for the making of latex gloves from either natural rubber latex or from synthetic latices such as nitrile latex with and without carboxylation, polyisoprene latex and polychloroprene latex and others.

The production of latex products such as medical gloves, condoms and toy balloons is usually done using a latex dipping process via a continuous chain dipping technology. The process of latex dipping involves first immersing a former in the shape of the desired product in a dipping tank containing compounded latex and then slowly withdrawing the former from the latex to have a uniform deposit on the former. The formation of the product is completed by the combination of processes of leaching, drying, vulcanization and other appropriate treatments. The product may also be subjected to forming a rolled bead at the open end of the latex article. In the case of producing gloves from dipping process, the formers used are in the shape of the hand.

Instead of just dipping a single former in the various operating processes, a series of formers can be continuously operated in the dipping processes through a continuous moving chain technology, which carries the formers through the former holders that are attached to the roller chain. The series of formers are then transported at a preselected speed through dipping tanks, oven, leaching tanks and other application treatments before finally the intended finished products are stripped or removed from the formers. After the removal of the finished products, the whole flow process is repeated.

Depending on the requirements, the control of the chain lines and formers can have a minimum of two axis machine employing a vertical and horizontal axis. A third axis is often required to cam the formers from formers down (0 degree) to a maximum formers up (180 degrees). Additional axis is also used when the formers need to be rotated axially about the
centreline of the former itself. In most factory operation, the movement of the former is
guided by a mounted track with adjustable orientation to either lower, raise the formers into
the dipping tank or to rotate or orientate the former when required.

The productivity of the dipping process depends among other things, on the speed of the chain
conveyor, the centre to centre pitch of the former holders. The chain speed can vary from a
few meters per minute to a high speed of over 40 meters per minute. The faster the speed, the
higher is the productivity. There is a limit in which the chain speed can be increased. The
maximum chain speed corresponding to the number of formers that can be conveyed per
minute depends on the dipping conditions and the final properties of the finished dipped
products. At fast chain speed, any slight instability of the former holder assembly can cause
the formers to vibrate during the dipping process. This can cause defects in the rubbery film
formed on the former resulting in dipped products having defects. Besides chain speed,
increasing the number of formers in each former holder assembly (i.e. a multi-former holder
assembly can hold more than one former) per cycle of dipping can also enhance the
productivity. In increasing the number of former attached on each former holder assembly
from one to two, will increase the productivity by 100%. It is essential that when more than
one former is mounted on a former holder to increase the productivity, the formers must move
steadily and independently when required. Proper mounting of the formers onto a multiple
former holder assembly is therefore important.

BACKGROUND OF INVENTION

In the factory dipping process, currently, the former is mounted onto the horizontal moving
chain through a shaft which is connected to a former holder which can be rotated and tilted as
required during the chain movement. These formers through the former holders are
positioned in series along the conveyer chain.

To increase the productivity, the former holder assembly is modified and designed by using
more than one former at a single point of the moving chain. This is done through a former
holder assembly which is designed to hold more than one former.
Description of the prior art

It will be advantageous in production if the conveyor chain can be used to accommodate sets of double formers. This can be done through the use of either a U-shaped bracket attached with two L-shaped arms each holding at least one former or a T-shaped pin which is attached to two hinges each holding a former, or the holders of formers are arranged in two tiers on both sides of the conveyor.

Patent MY121 188-A describes a method to mount two or more formers on a conveyer system with the holders for formers arranged in two or more tiers on both sides of the conveyer. Each tier has former holders which are separately coupled to the conveyer through an individual linkage arm, which is in turn mounted to the conveyer using a rotation hinge. It is claimed that the rotation of the formers in the separate tiers can be done independently because of the rotation hinges. A linkage arm is used to couple the former holder to the conveyer allowing changing of the orientation of the former holder relative to the conveyer independently of holders in the other tier.

The patent MY 140770 A describes another method using a T-shaped pin which is attached with a pair of hinges each holding a single former. The T-pins are connected to a shaft which is extended from the movable chain. The pair of hinges on the same shaft will be in a stacked configuration when in closed position and move apart in opened position.

One invention (MY 137254 A) describes the use of a holder bracket disposed with restraining means and two former holders. The bracket used is substantially a U-shaped member comprising of a base member and two upright walls. The U-shaped bracket together with the L-shaped former holders are pivotal using a rod-like member which enables the two L-shaped former holders to be movable in an arcuate motion between two positions. The L-shaped members for former holders are securely fitted onto the outer end of the upright portion of the U-shaped bracket. In the first position, the former holders are positioning in a horizontal
manner and in the second position, either one of the L-shaped formers is positioning substantially at 180°.

All the disclosures mentioned provide the possibility of increasing the capacity of the glove production using the double former systems. They fail to disclose the importance of system stability as well as the condition of dipping and the latex formulation in order to produce quality gloves using the double former holders.

SUMMARY OF THE PRESENT INVENTION

The present invention relates to an improved assembly of former holders for two or more formers. A U-shaped bracket and two improvised L-shaped arms are mounted together using a pivotal rod. Each of the improvised L-shaped arms forms part of a double former holder, each of which holds at least one former. The U-shaped bracket is then connected to the conveyor chain through a shaft.

The improvised L-shaped arms are in the same orientation of zero degree when in a closed position and can be open up to 180 degrees apart in an open position.

The two improvised L-shaped arms are arranged within the end plate of the U-shaped bracket. This arrangement makes two former holders nearer to the centre point of the connecting U-shaped bracket and that provides stability to the assembly.

Description of drawings

Figure 1 shows a 3 D view of an assembly of double former holder configuration consisting of two taper-Split- Y-L-shaped arms having two former holders which are connected to the U-shaped bracket.
Figure 2 shows the taper split Y geometry L-shaped arm and former holder set assembly.

Figure 3 shows the explode view of the U-shaped bracket and the mounting of the U-shaped bracket assembly to an extending shaft of the conveyor chain.

Figure 4 shows the top view, front view and side view of the double former holder assembly having the taper split Y-L-shaped arms and the U-shaped bracket connected to the conveyor chain.

10 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The production line of a latex product dipping process generally consists of at least a conveyor chain (C), guiding track (G) for the former holder, double former holder assembly (11) and other means known to the trade.

15 Disclosed in Figure 1, is a description of double former holder assembly (11) being attached to the production line. In this invention, a U-shaped bracket (12) which is part of the double former holder assembly is connected at the end of a shaft (S) that extends from the conveyor chain (C). If this invention is used in the production of latex gloves through dipping process, the formers used will be in the shape of a hand. Other formers of required shapes will be used in the production of condoms, balloons etc by those familiar with the trade. In the factory, the formers with be required to go through a series of processes guided by the guiding track in the production line to produce the final products at a certain speed. The selection of the speed will depend on the stability of the processing line to produce latex products of acceptable quality. Usually the speed varies from a few meters up to 40 meters per minute corresponding to the conveying of 80 to 200 former holders assembly per minute on one side of the conveyor chain.

The processes may include online washing of formers in the cleaning tank, coagulant dipping in the coagulant tank, former drying, dipping of former in the latex tank, latex gelling,
leaching, oven vulcanization, stripping of latex products from the formers and any other processes known to the trade. In many of these processes, the stability of the formers is important to ensure consistent quality product. Any unnecessary jerks of the formers in the production line which may be caused by high speed production can lead to defects of the final latex products.

The detailed view of the double former holder assembly (11) mounted on to the conveyor chain (C) through the extending shaft (S) is given in Figure 1 and Figure 4. The double former holder assembly essentially consists of a U-shaped bracket (12) and two taper L-shaped arms (13A and 13B). Figure 3 shows the exploded diagram of the U-shaped bracket (12) which has a base (16) and two vertical ends (17). Each of the vertical ends of the U-shaped bracket (12) has a concentric hole (30) so that a pivotal rod (18) can be securely mounted onto the U-shaped bracket through the holes (30). Figure 3 also shows the base (16) of the U-shaped bracket is securely connected to the extending shaft (S) of the conveyor chain (C) in manners known to the trade.

The L-shaped arm (13) consists of an upright portion (14) and a base portion (15). The upper end of the upright portion of the L-shaped arm is secured onto the U-shaped bracket (12). At the free end of the base portion of the L-shaped arms are secured with the former holders (20) through a bearing housing (28). The former holders which serve to hold formers can rotate freely because of the bearing housing in manners known to the trade. A pivotal rod (18) is used to securely hold the two L-shaped arms and the U-shaped bracket together. The centre of the pivotal rod has a circular recess (23) to accommodate a flat washer (24). A snap pin (25) is used to securely hold the pivotal rod to the U-shaped bracket (Figure 3).

The upper portion of the L-shaped arm can be rectangular or any other geometry. Figure 2 shows the preferred embodiment, wherein the L-shaped arm disclosed in this invention is essentially a taper-L-shaped arm that consists of an upright portion and a rectangular base portion. The upright portion of one of the two taper-L shaped arm is slanted slightly to the left with an inclination angle Θ(26), relative to the pivotal rod, greater than zero degree and less than 90 degrees and then become straight again. At an inclination angle of 90 degrees, the upper portion is of the rectangular shape. In the preferred embodiment, the angle is between 45° to 65° (26). Figure 2 shows the overall combo shape consisting one of a parallelogram and a rectangular joined at one end in the shape of a split Y geometry (Figure
2). The end of the upright portion of the taper-split Y-L shaped arm is in the shape of an annular ring (19) (Figure 2) which is fitted securely onto the pivotal rod (18). The base portion of the taper-split Y-L shaped arm is of a rectangular shape (15). The free end of the base portion of the taper split Y-L-shaped arm is fitted to at least one former holder in a manner known to the trade.

In the design of the integrated combo L-shape arm, it is necessary to take into account the possibility of fatigue failure. The stress on the annular ring (19, Figure 2) can be minimised by inserting a co-centric liner ring (27, Figure 2) serving as a bearing, which is made of a special material such as hard steel or engineering plastic. The co-centric liner ring (27) can reduce the coefficient of friction between the annular ring and the pivotal rod (18) of the U-shaped bracket (12). If needed, the rectangular portion of the split Y upright portion (14) and the rectangular part of the base portion (15) can be joined together with a diagonal plate (29) to provide additional reinforcement.

The other taper-split Y-L-shaped arm mounted onto the same pivotal rod will have the opposite orientation. The upper portion of the other taper-L-shaped arm will then be slanted to the right with the inclination angle at 135° to 115° and then become vertical downward so that the two vertical end of the upper portion of the two split Y-L-shaped arms are coplanar and aligned back to back with each other. The free-end of the base portion of the taper split Y-L-shaped combo is fitted to at least one former holder in a manner known to the trade.

Figure 1 shows the combo L-shaped arms are in the same orientation of zero degree when in the closed position and can be open up to 180 degrees apart in an open position.

The disclosed patent (MY 137254 A) described the L-shaped members for former holders being securely fitted onto the outer end of the upright portion of the U-shaped bracket. This arrangement makes the former and former holder far away from the centre point and it requires a greater movement and larger force when the two former holders are in an arcuate position. This may cause instability and vibration of the movement leading to defects of the dipped products.

In this preferred embodiment, the two taper split Y-L-shaped arms are arranged within the ends of the upright portion of the U-shaped bracket with the upper portion of the two split Y-L-shaped arms being coplanar and aligning back to back with each other in the closed position.
In this arrangement, the centres of gravity of the two former holders are close to the centre point of the U-shape bracket. The centre of the U-shaped bracket and the centre of the two taper L-shaped combos are coplanar and will not introduce any bending moment when a force is applied. This arrangement provides stability to the assembly and requires lesser force to open up the two L-shaped arms with the two former holders orientating in an arcuate position up to 150°. This will provide more stability and less vibration to the movement of the conveyor chain and to the former holders thus eliminating any negative impact on the quality of the dipped products caused by vibration.

The integral taper- L shaped arms can be made of carbon steel, stainless steel, engineering plastics, or metal alloy; whereas the U-shaped bracket can be made of carbon steel, steel or stainless steel and other suitable materials.

As mentioned earlier, the pivotal rod used in the preferred embodiment can be a circular or D-shaped rod with a recess (23) in the middle to accommodate a spacer or washer (24). The material for spacer or washer can be engineering plastic or special steel. The use of the spacer or washer is to reduce the friction of the pivotal annular rings of the two taper L shaped arms and to provide further stability and free movement of the former holders.

This invention serves to increase the productivity of the dipping process. With the double former holder assemble configuration (11) having enhanced stability, the chain speed of the dipping operation can increase up to 40 meters per minute corresponding to conveying of over 400 formers per minute on one side of the conveyor chain and still producing good quality dipped latex gloves. At the same conveyor chain speed, the preferred embodiment having double former holders assembly attached to the same pitch through the U-shaped bracket, will result in the productivity being twice that of a single former assembly.
CLAIMS

1. A former holder assembly (11) for holding former holders used in the latex dipping industry for the production of latex dipped products such as latex gloves comprising:

   At least one essentially U-shaped bracket (12) having one concentric hole (30) through each of the two upright ends (17) so that a bolt or a pivotal rod (18) can pass through the holes and being securely fastened to the bracket;

   Two L-shaped arms (13A, 13B) comprising of an upright portion (14) and a base portion (15) serving as part of the former holder assembly. The upper end of the upright portion (14) of the L-shaped arms (13A, 13B) is fitted securely on to the pivotal rod (18) of the U-shaped bracket (12) wherein the free end of the base portion (15) is designed to hold at least one former holder (20);

   A pivotal rod (18) which is used to securely hold the two L-shaped arms (13A, 13B) and the U-shaped bracket (12) together. A snap pin (25) is used to securely hold the pivotal rod (18) to the U-shaped bracket (12). The two L-shaped arms (13A, 13B) are fitted within the two ends (17) of the U-shaped bracket (12);

   wherein this arrangement allows one of the two former holders (20A, 20B) to move, in an ancuate motion, by the provision of a guide (G), independent of the other former holder (20A, 20B). The two former holders (20A, 20B) are at a closed position when the two L-shaped arms holding the former holders are at the same base position with their upright portion being in a back-to-back position (Figure 1). When one of the former holders is moved via the guide, the two former holders (20A, 20B) are in an open position (Figure 1) and the orientation of one of the L-shaped arms can be up to 180° from the position of the other L-shaped arm.
2. The holder assembly (11) according to claim 1, wherein the upper end of the upright portion (14) of the L-shaped arms (13A, 13B) is in the shape of an annular ring (19) which can be fitted on to the pivotal rod (18). The annular ring (19) also has a liner ring serving as a bearing (27) allowing the L-shaped arms (13A, 13B) to rotate along the pivotal rod (18) if needed. The free end of the base portion (15) of the L shaped arms (13A, 13B) is designed to hold at least one former holder (20) through a bearing housing (28).

3. The holder assembly (11) according to claim 1, wherein the centre of the pivotal rod (18) has a circular recess (23) to accommodate a flat spacer or washer (24). The two L-shaped arms (13A, 13B) are mounted on either side of the washer (24) and within the two ends of the upright portion (17) of the U-shaped bracket (12).

4. The holder assembly (11) according to claim 1, wherein the L-shaped arm (13A, 13B) can be produced in a single piece. The integral L-shaped arm can be made of carbon steel, stainless steel, engineering plastics, or metal alloy; whereas the U-shaped bracket can be made of carbon steel, steel or stainless steel or metal alloy and other suitable materials.

5. The holder assembly (11) according to claim 1 or claim 2, wherein the upper portion (14) of the L shape arms (13A, 13B) below the annular ring (19) is slightly tapered (Figure 2). One of the two taper L-shaped arms (13A, 13B) is slanted slightly to the left with an inclination angle of 45° to 65° relative to the pivotal rod (18) and then become straight; wherein the other taper L-shaped arm (13A, 13B) which is mounted on the same pivotal rod (18) within the two upright portion (17) of the U-shape bracket (12) is also a taper-L-shaped arm of split Y geometry having an angle of inclination of 135° to 115° (16) such that the vertical portion of the taper-L-shaped arm (13A, 13B) is aligned back to back with that of the other taper-L-shaped arm (13A, 13B).

The overall combo shape of the taper L-shaped arm is one of a parallelogram and a rectangular joined at one end in the shape of a split-Y geometry (Figure 4). The free
end of the base portion (15) of the taper L shaped arms (13A, 13B) is designed to hold at least one former holder (20) through the bearing housing (28).

6. The holder assembly (11) according to claim 5, wherein the two taper-split Y-L-shape arms (13A, 13B) are fitted within the two ends (17) of the U-shaped bracket (12) with the vertical portion (14) aligning back to back and the two base plates (15) which hold at least one former holder (20) are in zero degree orientation at this closed position.

7. The holder assembly (11) according to claim 6, wherein the two taper-split Y-L-shaped arms (13A, 13B) can be opened up to 150 degrees in the open position through the imposition of a guide to one of the former holders.

8. The holder assembly (11) according to claims 6 or 7, wherein the combos of the U-shaped bracket (12) and the two taper-split Y-L-shaped arms (13A, 13B) will be geometrically stable and require a lesser force to effect an arcuate motion in the open position.

9. According to claim 8, wherein with the double former holder assemble (11) configuration having enhanced stability, the chain speed of the dipping operation can increase up to 40 meters per minute corresponding to conveying of over 400 formers per minute on one side of the conveyor chain and still producing good quality dipped latex gloves.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. B29C41/34 (2006.01) i, A41D19/04 (2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl. B29C41/00-B29C41/52, A41D19/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Published examined utility model applications of Japan 1992-1996
Published unexamined utility model applications of Japan 1971-2014
Published registered utility model applications of Japan 1994-2014

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tr>
<td>A</td>
<td>CN 1480314 A (YCOTON BHD) 2004.03.10, page 5, line 28 to page 7, line 9, Fig. 1-11 &amp; MY 121188 A</td>
<td>1-9</td>
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<tr>
<td>A</td>
<td>JP 3045781 U (Li Maosheng) 1997.11.19, [0004] - [0015], Fig. 1-9 (No Family)</td>
<td>1-9</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:
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Date of the actual completion of the international search
01.12.2014

Date of mailing of the international search report
09.12.2014

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Form PCT/ISA/210 (second sheet) (July 2009)