March 31, 1970 SHOHACHI MASAI ET AL 3,503,537

APPARATUS FOR FEEDING RAYON CAKE WRAPPING NETS AUTOMATICALLY INTO AUTOMATIC WRAPPING MACHINE

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FIG. 1

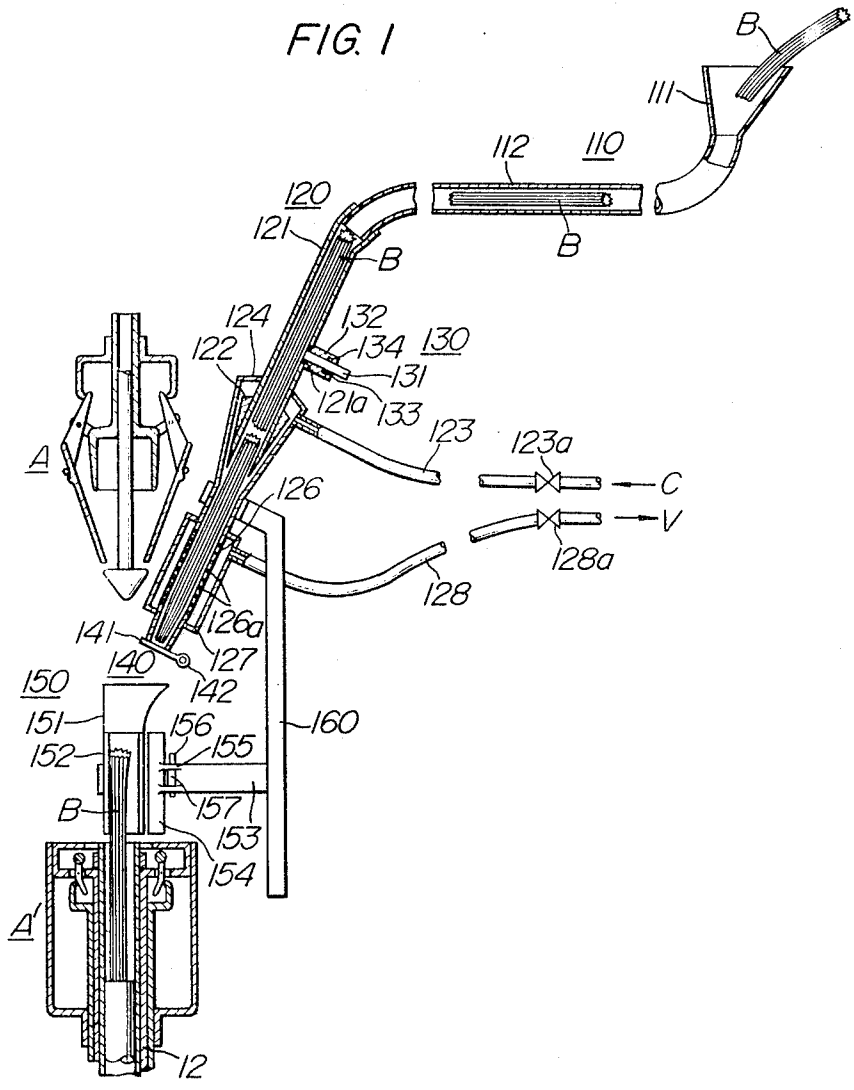

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FIG. 2

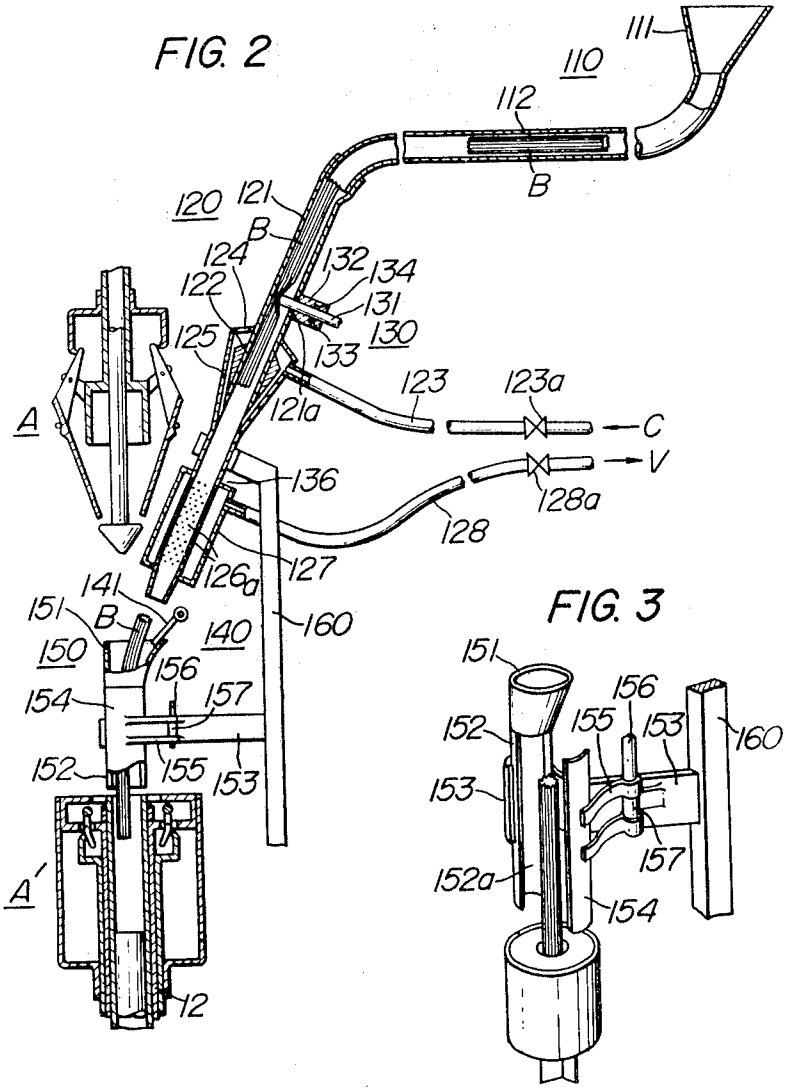

FIG. 3

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APPARATUS FOR FEEDING RAYON CAKE WRAPPING NETS AUTOMATICALLY INTO AUTOMATIC WRAPPING MACHINE

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Int. Cl. B65h 3/08
U.S. Cl. 221—278 4 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for feeding rayon cake wrapping nets automatically into an automatic wrapping machine, the apparatus having a conveyor tube for receiving the wrapping nets and a guide aligned with the receiving head of the wrapping machine for transferring of an individual wrapping net thereto in a predetermined time relationship. The feeding apparatus is provided with a pressure injector for injecting a wrapping net into the guide and a vacuum device for drawing additional wrapping nets into the conveyor tube to replace those removed by the pressure injector, and a holding member being provided to hold a following wrapping net in the conveyor tube where the pressure injector is forcing a wrapping net into the guide and to release it when the vacuum device is drawing an additional wrapping net into the conveyor tube.

This invention relates to an apparatus for feeding rayon cake wrapping nets automaticaly into an automatic wrapping machine. More particularly this invention relates to an apparatus for automatically feeding tubular nets, preferably corrugated tubular nets, made of cellulosic material and delivered from a remote station e.g. from a corrugating machine, into the automatic rayon cake wrapping machine such as the one disclosed in a copending application U.S. Ser. No. 420,571, filed on Dec. 23, 1964, now Patent No. 3,354,612.

As is well known, it is a common practice to wrap each individual rayon cake produced by a centrifugal method with a tubular paper or a fabric net for its protection. A highly efficient apparatus for automatically wrapping rayon cakes with corrugated tubular nets is disclosed in the above-mentioned copending application. However, feeding of nets to such an automatic wrapping machine has been heretofore carried out manually. Accordingly, it has been desirous to establish a wholly automatic and continuous operating system from net feeding to wrapping with net to increase production efficiency and to decrease labor cost.

In the past, the cake wrapping operation has been principally manual because both cakes and wrapping nets are characteristically soft and frail and particularly the former are susceptible to thread derangement and damage making it necessary to handle them carefully by a complicated procedure. Various proposals have, of course, been made to mechanize the wrapping operation but up to the present none of them have been put into practice with any success.

An object of the present invention is to provide an apparatus for feeding tubular nets, preferably corrugated tubular nets, to units of an automatic rayon cake wrapping machine continuously and automatically and to coordinate the motions of the feeding apparatus with the cake wrapping machine.

The foregoing object and other advantages can be attained with the apparatus of the present invention which

comprises a tubular net receiving mouth, a pipe extending therefrom to a valve means hereinafter described, a tubular net holding means which is fitted in the pipe and holds a tubular net by pressing it to the wall of the pipe during the operation stage of compressed air injection hereinafter described, a compressed air injecting means which is fitted in the pipe at the down part of the holding means, connected to a compressed air source and injects compressed air to shoot or push, a tubular net into an automatic wrapping machine through a guide means hereinafter described, a suction means which is fitted in the pipe at the down part of the compressed air injecting means, connected to a vacuum source and draws or sucks a tubular net from the receiving mouth, a valve means which closes and stops a tubular net thereupon during the suction stage of operation and opens and releases a tubular net during the compressed air injecting stage of operation and a cylindrical guide means which is installed at a position capable of feeding a tubular net from the valve means to an automatic wrapping machine and separates into two half pieces during the stage of operation of said automatic wrapping machine with a tubular net thereupon detaching from said cylindrical guide.

For a better understanding of the invention reference will now be made to the following detailed description to be read in conjunction with the accompanying drawings, in which:

FIGURE 1 is a schematic elevational view of the apparatus of the present invention used in conjunction with the automatic wrapping unit disclosed in the aforementioned copending application illustrating the phase in which the valve is closed.

FIGURE 2 is also a schematic elevational view illustrating the phase in which the valve is opened,

FIGURE 3 is an enlarged perspective view of the cylindrical guide of the apparatus for delivering a tubular net into an inner tube of the lower head A' of the automatic wrapping machine disclosed in the above-mentioned U.S. Ser. No. 420,571.

Referring now more specifically to the accompanying drawings, the feeding apparatus is separated into five parts, and comprises a delivering part **110**, a chute part **120**, a tubular net holding means or piston part **130** which acts as the above-mentioned holding means, a valve part **140**, and a guide part **150**. As shown in FIGURES 1 and 2, the present apparatus is carried by a supporting frame **160**, and an arm **153** which extends from the frame **160** carries the guide part (unnumbered) and another arm **150** carries the other four parts.

The delivery part **110** generally includes a funnel-shaped mouth **111** for receiving tubular nets at the top of this part and a tubular net transporting pipe **112** having a sufficient diameter for passing tubular nets therethrough. The lower end of this part **110** is connected with the upper entrance end of a tubular net receiving cylinder **121** of the chute part **120**.

The chute part **120** generally includes the tubular net receiving cylinder **121** which is adapted to contain a leading, an intermediate and a trailing wrapping net, a conical compressed air chamber **124** fitted at the outside of the lower end of the net receiving cylinder **121**, a torpedo-like block **122** forming the lower end of the net receiving cylinder **121**, and a chute cylinder **126**. The conical compressed air chamber **124** is connected to a compressed air valve **123***a* by means of a compressed air pipe **123**. The torpedo-like block **122** serves to direct the flow of the compressed air toward the valve part by forcing the compressed air to pass through a narrowed passageway formed between the inside wall of the conical compressed air chamber and the outside wall of the torpedo-like block **122**. The end of the conical compressed

air chamber has the same size as the net receiving cylinder and is connected to the chute cylinder **126**. In the middle part of the chute cylinder **126** there are bored a number of small holes **126***a* which perform a function of suction holes **126***a* during the suction stage of operation. Surrounding this part, i.e. the suction holes **126***a*, there is a suction chamber **127** from which a vacuum pipe **128** extends to a vacuum valve **128***a*. The chute cylinder **126** has an exit end which terminates at a slightly narrower part underneath which the valve part **140** is fitted.

The piston part **130** is affixed to the upper part of the receiving cylinder **121**. The side wall of the receiving cylinder **121** has a hole or opening **121***a* of a sufficient size to permit a piston rod **131** to pass through into and out of the receiving cylinder **121**. A piston cylinder **132** is connected substantially perpendicularly to the wall of the receiving cylinder **121**. A seal ring **134** inserted in a grooved part **133** of the inside wall of the piston cylinder contacts tightly with the piston rod **131**. The piston rod makes a reciprocating motion between the portion of the wall of the cylinder **121** having the hole **121***a* and the portion of the wall opposite thereto in order to press a tubular net against the wall of the receiving cylinder and to release the tubular net therefrom.

The valve part **140** includes a valve body **141** and a fulcrum **142** which controls the opening and closing of the end of the chute cylinder **126**.

The guide part **150** is placed at a most suitable position on an orbit on which units of the automatic wrapping machine of the type disclosed in the aforementioned copending application rotate about a main shaft while being aligned with both an upper head A and a lower head A′ of the automatic wrapping machine during the shooting or descending stage of operation. The guide part includes a conical hopper **151** on the top and a cylindrical guide **152**. The cylindrical guide **152** can be separated into two parts; one is a fixed or stationary guide part **152***a* (see FIG. 3) carried by a supporting arm **153** and the other is a movable guide part **154** which is rotatable by arms **155** about a shaft **156**. The shaft **156** is secured by a bearing **157** carried by the fixed arm **153**.

The operation of compressed air valve **123***a*, vacuum valve **128***a*, piston rod **131**, fulcrum axis **142** and shaft **156** are individually controlled by the driving system (not shown in the drawing) of the upper head A and the lower head A′ of the automatic wrapping machine and they perform intermittent individual movements coordinated with the movement of the latter. In other words, in the condition or feeding phase, shown in FIG. 1, when the compressed air valve **123***a* closes, the vacuum valve **128***a* opens, the piston rod **131** is in its right side in active position, being moved back to the hole **121***a* of the receiving cylinder **121**, the valve body **141** of the valve part is in the upper closed position closing the lower end of the chute cylinder **126** and the movable guide part **154** is in its separated position moved from the fixed guide part **152***a* of the cylindrical guide **152** leaving free space between the movable guide part **154** and the fixed guide **152***a*. When the compressed air valve **123***a* opens, the feed apparatus is in the condition or non-feeding phase shown in FIG. 2 and the vacuum valve **128***a* closes, the piston rod **131** is in its left side in active position, the end of which extends to the opposite inside wall of the receiving cylinder **121**, the valve body **141** of the valve part is in its lower open position, opening the lower end of the chute cylinder **126** and the movable guide part **154** forms a complete cylinder together with the fixed guide part **152***a*. All of these motions are carried out by known mechanically interlocking mechanism.

The operation of the present apparatus will be described hereinafter.

When a tubular net B which has been corrugated by a corrugating machine (not indicated in the figure) to give a star-like cross section, drops into the funnel-shaped

mouth **111** of the delivery part by the motion co-ordinated with those of the upper head A and the lower head A′ of the automatic wrapping machine as indicated in FIGURE 1, the compressed air valve **123***a* closes, the vacuum valve **128***a* opens and the valve body **141** at the end of the chute cylinder **126** closes, hence the tubular net B is sucked into the chute cylinder **126** from the funnel-shaped mouth **111** through the pipe **112** and the receiving cylinder **121**. When the cycle changes and the compressed air valve **123***a* opens, the vacuum valve **128***a* closes. As soon as the compressed air is injected downward from the narrowered passage way **125**, the valve body **141** moves down to its open position and the bottom of the chute cylinder **126** opens. Hence the net B held by the valve body **141** is forced and thrown by compressed air C through the hopper **151** of the guide part **150** and the empty cylinder formed by the fixed guide part **152***a* and the movable guide part **154** into a central part of the lower head A′ of the automatic wrapping machine and settled there. When the cycle further changes and the compressed air valve **123***a* closes, another net B corrugated by a corrugating machine (not indicated in figures) drops into the funnel-shaped mouth **111** and the same operations are repeated. However at this moment, the movable guide piece **154** turns around the shaft **156** and is moved away from the fixed guide **152***a* in such a way that free space is formed on the orbit of the lower head A′ of the automatic wrapping machine. On this account, in spite of the sticking out top, the net B sealed in the central tube is carried together without being disturbed in accordance with the movement of the upper head A and lower head A′ to the position where the wrapping of rayon cake is freely carried out. The movable guide piece **154** returns to the position where a complete cylinder **152** is formed together with the fixed cylindrical guide **152***a* in order to be ready for receiving further net as soon as the cycle starts where the compressed air valve **121***a* opens.

The above-mentioned operation is the case in which only one corrugated tubular net is delivered, but in the actual operation, another similar tubular net B follows continuously in accordance with the motion of the automatic wrapping machine. This continuous operation is carried out by repeated synchronized motion of the piston rod **131** at the position near the entrance of the receiving cylinder **121** while holding the net and then releasing it. In other words, during the cycle where the compressed air valve closes, the forerunning net B is in the lowest position of the chute cylinder **126** and after-running net B follows immediately after the forerunning one. Just before the opening of the compressed air valve **123***a*, the piston rod advances, presses and holds the after-running net B against the inside wall of the receiving cylinder and only allows the forerunning one to be pushed out.

As above-explained, the present apparatus provides for the feeding of nets B by a simplified mechanism and not only saves labor but also guarantees a reliable and speedy operation.

What we claim is:

1. Apparatus for automatically feeding tubular wrapping nets for rayon cakes into a lower head of an automatic wrapping machine, said feeding apparatus having a feeding phase coordinated with the lower head to feed a wrapping net thereto and a non-feeding phase, comprising:

(A) a delivery part having a funnel-shaped mouth for receiving tubular nets,

(B) a chute part including a net receiving cylinder adapted to hold a leading, an intermediate and a trailing wrapping net and having an upper entrance end extending from said delivery part and a lower exit end, said chute part including compressed air injection means connected with said receiving cylinder and a source of compressed air for injection thereinto of compressed air during the feeding phase and suction means connected with said receiving cylinder

proximate to said exit end and a source of vacuum for drawing a wrapping net from said delivery part into said receiving cylinder during the non-feeding phase adapted to receive and hold therebetween the leading wrapping net from said cylinder,

(C) a guide part including a stationary member and a movable member, said guide part being aligned with said lower exit end during the feeding phase and movable into alignment with the lower head of the automatic wrapping machine for transferring the wrapping net thereto during the non-feeding phase, said movable member being movable away from said stationary member to release the last-mentioned wrapping net for discharge into the lower head,

(D) valve means associated with said lower exit end and said guide part and having a closed position for closing said exit end and an open position for opening thereof to respectively hold the leading wrapping net in said cylinder during the non-feeding phase and to permit the leading wrapping net to be discharged therefrom into said guide part in response to the injection of the compressed air into said receiving cylinder by said compressed air injection means during the feeding phase, and

(E) tubular net holding means connected with one portion of the wall of said receiving cylinder to press a tubular net against another portion of the wall during the feeding phase thereof and to release it therefrom during the non-feeding phase,

the tubular net holding means permitting solely the leading net to be pushed into said guide part by said air injection means during the feeding phase while holding the intermediate net against the inside wall of the receiving cylinder and to release the intermediate net when said suction means draws the wrapping net from said delivery part into said receiving cylinder.

2. An apparatus according to claim 1 in which said tubular net holding means includes a piston passing through said one portion.

3. An apparatus according to claim 1 in which said compressed air injecting means includes a conical compressed air chamber and a torpedo-like block through which tubular nets pass a central part thereof and a narrowed passage way formed by the inside wall of the conical compressed air chamber and the outside wall of the torpedo-like block through which the compressed air is injected.

4. An apparatus according to claim 1 in which said suction means includes a number of small passageways through the wall of said pipe and a suction chamber surrounding said passageways.

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