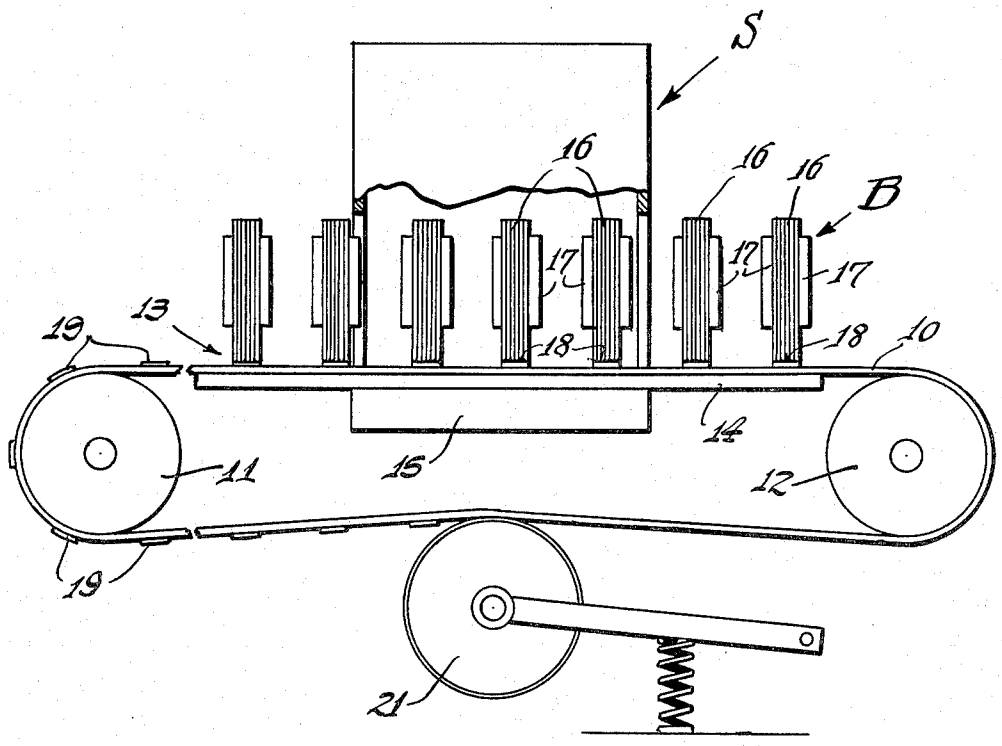
March 30, 1965 B. LERNER 3,175,923

EXCESS ADHESIVE REMOVAL FROM A MOVING BELT

Filed March 7, 1961



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United States Patent Office 3,175,923 Patented Mar. 30, 1965

3,175,923

EXCESS ADHESIVE REMOVAL FROM A MOVING BELT

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Filed Mar. 7, 1961, Ser. No. 93,970
8 Claims. (Cl. 117—102)

The present invention relates to an improvement for removing thermoplastic elastomeric adhesive material from a belt and more particularly to its use in a book drying machine for the removal of the excess adhesive.

In the binding of books or the like devices comprising a plurality of signatures or elements which are clamped together and have an adhesive applied to one edge thereof, a problem has arisen due to the excess adhesive dropping from the books or leaving the books as they pass through the heating station. This is particularly difficult when thermoplastic adhesives such as polyvinyl acetate are used due to the extreme tackiness of the adhesive when heated.

The present invention has for an object a novel means and method of drying books and removing the excess adhesive in a simple and expeditious manner.

In carrying out this object of the invention the clamped signatures or elements having a thermoplastic elastomeric adhesive, such as polyvinyl acetate glue, applied along one edge, are supported on a belt having a Teflon surface and preferably on a Teflon belt and moved through a drying station in which high frequency heating is used to dry the adhesive on the books, Teflon being the trademark for polytetrafluoroethylene. As the books pass through the heating station, the excess adhesive on the books is deposited on the Teflon belt. The books are removed and the Teflon belt carrying the excess adhesive is moved through a closed path. At a point remote from the heating station, the adhesive carrying surface of the belt is engaged by a metal roller which is cooler than the adhesive. This chills the thermoplastic adhesive and causes the adhesive to have a greater adhesion to the roller or the adhesive material on the roller than it does to the Teflon surface and be completely transferred to the roller. After a period of time, the build-up of the adhesive on the roller is removed by cutting the layer and stripping it from the roller.

It has been found that this greatly simplifies a problem heretofore encountered since it, in effect, peels the adhesive completely from the belt and cleans the surface of the belt without the need of scrapers, vibrators or additional elements or apparatus for acting on the belt.

Other features and advantages of the invention will be apparent from the specification and claims when considered in connection with the accompanying drawing in which the figure shows a diagrammatic view of the device of the present invention.

While the present invention may be used to remove excess thermoplastic adhesive from various articles, it has been found particularly useful and is disclosed herein as being used in a book binding system wherein a plurality of signatures or sections are clamped together tightly in a binding machine and have a thermoplastic elastomeric adhesive applied along one edge. Such machines are conventional in the art and are, therefore, not illustrated herein. After the books have the adhesive applied to the edge, they are then moved to a drying station in which heating means are provided for drying the adhesive. The problem of taking care of the excess thermoplastic adhesive during and after the drying state has been a problem of long standing.

The present invention solves this problem by providing

a smooth plastic surface of a release material, preferably of Teflon or the like which may be reinforced as required, to receive and support the books in the drying station. In the illustrated form of the invention this surface comprises a continuous belt 10 of Teflon or the like plastic material which is carried around at least a pair of pulleys 11, 12, at least one of which is driven to move the belt in a closed path and which is provided with an elongate book supporting stretch 13 passing through the drying or heating station S. Preferably, the stretch 13 of the belt passing through the heating station rests on a thin buffer member 14 of silicone-Fiberglas which will support the belt and the articles carried thereby. Immediately below the buffer member is a highly frequency heater 15 which acts to dry and set the adhesive.

In accordance with the present invention the books B, comprising a plurality of signatures 16 clamped together by clamps 17 and having thermoplastic adhesive, such as polyvinyl acetate adhesive, applied along one edge 18 thereof, are moved through the heating station.

While the books can be carried by a conveyor moving in synchronism with the belt, it is at present preferred to support them with the edge 18 having the adhesive thereon resting on the belt and in very close heat-receiving relation with the heating means 15 which preferably operates at a higher frequency and at a higher voltage than normal for heaters of this type. As the books move through the heating station, the heat will drive off the solvents from the thermoplastic adhesive and secure the edges of the signatures together with the excess adhesive which is soft and tacky adhering to the belt as indicated at 19.

In order to remove the adhesive from the belt, the present invention provides a roller 21 which is cooler than the adhesive and which engages the surface of the belt having the excess adhesive thereon at a point remote from the heating station. This causes the adhesive to peel or strip off the belt and transfer completely to the roller. While the roller 21 can be a separate roller, in the illustrated form of the invention the roller engages the stretch of belt remote from the stretch 13 and is resiliently mounted so as to also function as a belt-tightening roller. After the adhesive has built up on the surface of the roller to a layer of predetermined thickness, it is cut and stripped from the roller.

While the exact theory of the cause for the transfer of the excess adhesive to the belt and then to the roller is not known, one explanation is that the thermoplastic adhesive as it passes through the drying station will have the excess portion thereof softened by the heat which reduces the cohesiveness of the material and permits it to break free and remain on the belt. The excess which is very tacky will adhere to the Teflon surface or belt which normally has little attraction for the thermoplastic adhesive. As the adhesive on the belt moves out of the heat zone and into engagement with the cool roller 21, the tacky adhesive will have greater affinity for the roller than for the Teflon belt and the cooling of the adhesive will cause the cohesiveness of the material to increase and insure the transferring of all of the thermoplastic adhesive from the belt to the roll.

It will be seen, therefore, that the present invention provides a simple, novel and unique method and apparatus for removing the excess adhesive from the belt without requiring instrumentalities such as vibrators, scrapers or other apparatus working on the belt.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. The process of removing excess thermoplastic elastomeric adhesive from the adhesive-bearing edge of books,

the steps of drying the adhesive and engaging and transferring any excess adhesive to a surface of release material, engaging the transferred adhesive on said release material with a cool surface to cause the transferred adhesive to be released from the release material and adhere to said cool surface.

2. The process of removing excess thermoplastic elastomeric adhesive from the adhesive-bearing edge of books, the steps of drying the adhesive and engaging and transferring any excess adhesive to a continuously moving surface of release material, engaging the transferred adhesive on said release material with a moving cool surface to cause the transferred adhesive to be completely released from the release material and adhere to said cool surface.

3. The process of removing excess thermoplastic elastomeric adhesive from the adhesive-bearing edge of books, the steps of moving the books and drying the adhesive, engaging and transferring any excess adhesive on the books to a moving surface of release material moving in the same direction as the books, engaging the moving surface of release material with a rotating cool surface to cause the transferred adhesive to be completely released from the release material and adhere to said cool surface, and stripping the adhesive from the rotating cool surface.

4. The process of removing excess thermoplastic elastomeric adhesive from the adhesive-bearing edge of books, the steps of moving the books and drying the adhesive, engaging and transferring any excess adhesive to a moving surface of release material moving at the same rate of speed as the books, engaging the moving surface of release material with a rotating cool surface moving at the same rate of speed as the release material to cause the transferred adhesive to be completely released from the release material and adhere to and build up on said rotating surface, and removing the adhesive from said rotating surface.

5. A device for drying and removing excess thermoplastic elastomeric adhesive from the edge of books at a drying station comprising a smooth surface of release material disposed below the books to engage and remove the excess adhesive from the books, a heater in the drying station for applying heat to the books to dry the edge, and a cool roller movable over and engaging the adhesive-carrying surface of release material to cause the adhesive to adhere thereto and be released from the surface.

6. A device for drying and removing excess thermoplastic elastomeric adhesive from an adhesive-carrying edge of books passing through a drying station comprising a continuous belt having a surface of release material having a stretch movable through the drying station and disposed below the books to engage and remove the excess adhesive from the books, a heater disposed below said stretch of belt for applying heat to the books to dry the edge, and a cool roller engaging the adhesive-carrying surface of the belt at a point remote from said stretch to cause the adhesive to adhere thereto and be released from the surface of the belt.

7. A device for drying and removing excess thermoplastic elastomeric adhesive from an adhesive-carrying edge of books passing through a drying station comprising a continuous belt having a surface of release material having a stretch for receiving and moving the books through the drying station, supporting means disposed below the stretch to support said belt and books with the adhesive-carrying edge engaging the belt, said belt having a surface for receiving excess adhesive from the books, a heater disposed below said stretch of belt for applying heat to the books to dry the edge, and a cool roller engaging the adhesive-carrying surface of the belt at a point remote from said stretch to cause the adhesive to adhere thereto and be released from the surface of the belt.

8. A device for drying and removing excess thermoplastic elastomeric adhesive from an adhesive-carrying edge of books passing through a drying station comprising a continuous smooth polytetrafluoroethylene belt having a stretch for receiving and moving the books through the drying station, supporting means disposed below the stretch to support said belt and books with the adhesive-carrying edge engaging the belt, said belt receiving excess adhesive from the books, a heater disposed below said stretch of belt for applying heat to the books to dry the edge, and a cool belt-tightening roller engaging the adhesive-carrying surface of the belt at a point remote from said stretch to cause the adhesive to adhere thereto and be released from the surface of the belt, said roller being resiliently mounted to maintain tension in the belt and yielding to permit a layer of adhesive to be built to a predetermined thickness thereon before the layer is removed therefrom.

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