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PAPER OR LIKE TUBE

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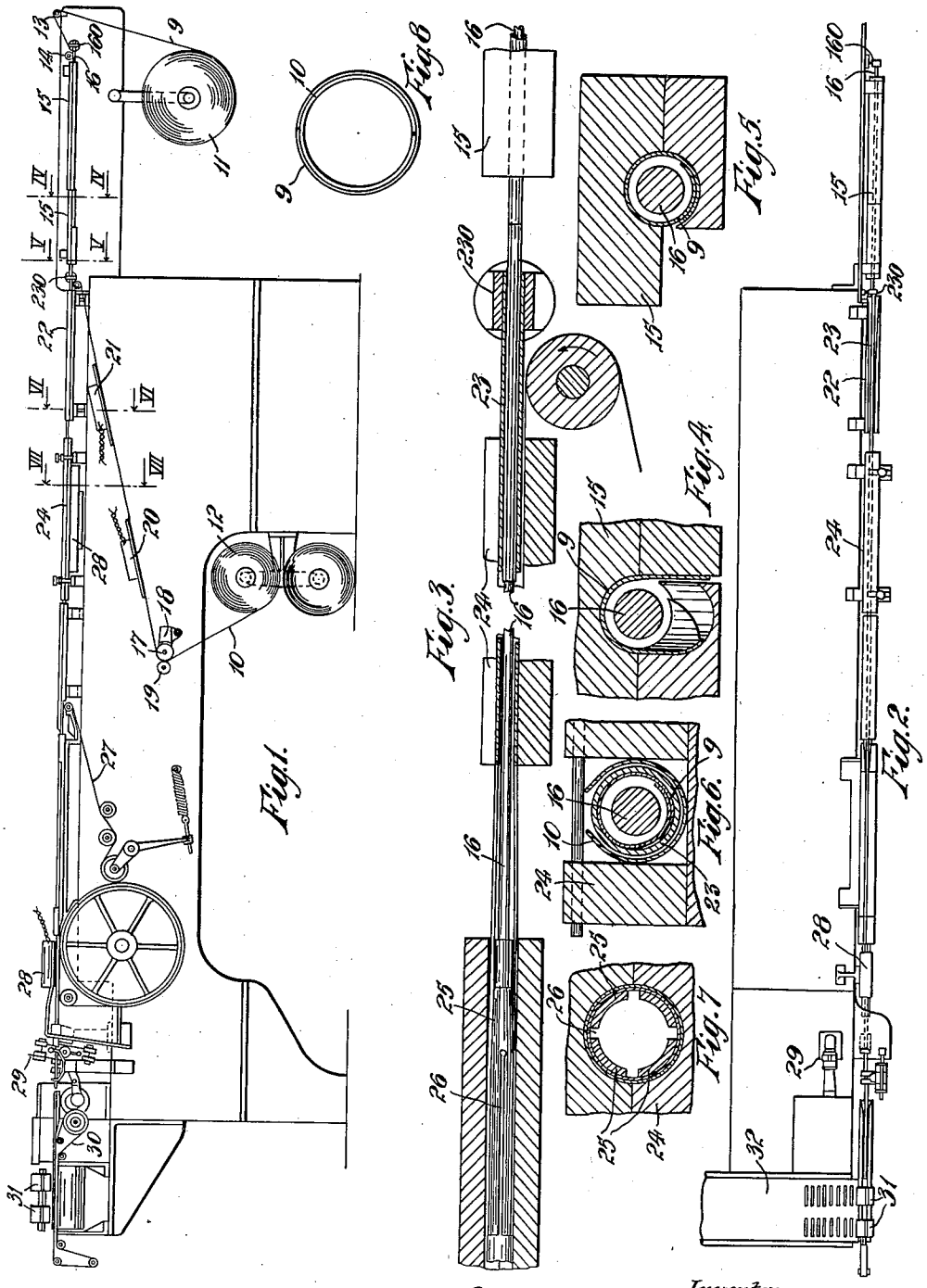

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Inventors

Walter Everett Molins, deceased, Harold Bernardo Molins and Moses Hyman Isaacs, Executors, and Ernst Curt Muhlbauer

By Watson, Cole, Grindle & Watson

Attys.

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PAPER OR LIKE TUBE

Walter Everett Molins, deceased, late of Deptford, London, England, by Harold Bernardo Molins, Deptford, London, England, and Moses Hyman Isaacs, London, England, executors, and Ernst Curt Mühlbauer, Deptford, London, England

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This invention is for improvements in or relating to the manufacture of paper and like tubes, such for example, as paper tubes to be used in the manufacture of mouthpiece cigarettes.

The term "paper and like tubes" is intended to include tubes made from paper, strawboard, cardboard and other similar material.

According to the present invention there is provided a paper or like tube formed from strip material folded into tubular form with the longitudinal edges of the strip abutting and secured by a butt joint comprising a single cover member which is secured to the inside of the tube. The cover member of the butt joint may comprise an inner tube within the said tube. The tube may be severed from a continuous tube formed from a continuous length of strip material which is folded into tubular form with abutting longitudinal edges and a continuous length of strip material to constitute the cover of the butt joint is secured to the inside of the tube whilst the strips are moving lengthwise.

Further, according to the present invention there is provided a method of forming the paper or like tube above referred to, which method comprises folding a continuous strip of material into tubular form whilst the strip is moving lengthwise to form an inner tube of smaller cross-section than the inside cross-section of the outer tube, forming into an outer tube around the inner tube a second continuous strip of material whilst the latter is moving lengthwise, the outer tube being of the desired cross-section and having the longitudinal edges of the strip abutting, applying adhesive to at least one of the strips of material, the adhesive being applied to that surface of a strip, or of each strip which is to engage with the other strip, expanding the inner tube into engagement with the outer tube and severing the continuous tube into desired lengths.

Further, according to the present invention there is provided mechanism for forming the tubes above referred to, said mechanism comprising means to move two strips of material in a lengthwise direction, means to apply adhesive to at least one of said strips, the adhesive being applied to that surface of a strip, or of each strip which is to engage with the other strip, folding means disposed in the path of said strips and arranged to fold the outer strip into a tube about the inner strip, means to restrain said inner strip from engagement with the outer strip during the formation of the tube, and means to sever the tube into desired lengths. Means may be provided to fold said inner strip to form an inner tube having a cross-section smaller than that of the inside of the outer tube. The inner strip restraining means may comprise a guide or guides disposed between the inner and outer strips (e. g., a tube through which the inner tube is passed) and if desired, means may be provided to press the inner strip against the inner surface of the outer tube after the formation thereof.

The invention will be described by way of example with reference to the accompanying drawing, in which:—

Figure 1 is a diagrammatic side elevation of mechanism for forming paper or like tubes.

Figure 2 is a plan of Figure 1.

Figure 3 is an elevation partly in section of a part of the folding mechanism and is drawn to an enlarged scale.

Figures 4, 5, 6, and 7 are sectional elevations drawn to an enlarged scale, the sections being taken on the lines 4—4, 5—5, 6—6, 7—7 respectively of Figure 1.

Figure 8 is an end view of a tube drawn to an enlarged scale.

Like references refer to like parts throughout the specification and drawing.

Referring to the drawing, the tubes which are to be made by the mechanism illustrated therein are formed from strip material which is led in the form of continuous strips 9 and 10 from reels 11 and 12. The strip 9 will be referred to as the inner strip and is folded, in a manner about to be described, to form an inner tube, whilst the strip 10 which will be referred to as the outer strip is folded about the inner strip and is provided with adhesive which, when the two strips are caused to engage with each other, causes them to be united. The inner strip 9 is led around guide rollers 13 and 14 and is passed through a garniture 15 in which the strip is folded into the desired form. A rod 16 is arranged inside the garniture and the strip is folded outside of the rod as can be seen from Figures 3, 4, and 5; the purpose of the rod 16 will be apparent later.

The garniture 15 tapers from that end at which the inner strip 9 enters, so that the inner strip is gradually shaped so that it assumes the form shown in Figure 5 from which figure it will be seen that one longitudinal edge of the inner strip overlaps the other longitudinal edge.

The cross-section of the inner tube thus formed is smaller than the inside cross-section of the outer tube which is formed by folding the outer strip 10 in the manner described below.

The garniture 15 is made in any suitable manner, and as illustrated it is built up from sections of suitable material which are shaped so as to fold the inner strip 9 to form a tube of the desired cross-section, see Figures 4 and 5.

The outer strip 10 passes from the reel 12 over a roller 17 which rotates in an adhesive bath 18, the roller 17 being arranged to apply adhesive to that surface of the outer strip 10 which is to engage with the inner strip. A pressure roller 19 presses the strip against the roller 17. The outer strip 10 is then passesd over heating elements 20

and 21 which partly dry the adhesive and cause it to become tacky.

After the adhesive has been applied to the outer strip 10 and partly dried, the strip 10 passes into a garniture 22 which causes the longitudinal edges of the outer strip 10 to be folded about a hollow tube 23, but the strip does not come into engagement with the tube 23, as can be seen from Figure 6. The hollow tube 23 constitutes a restraining member which controls the cross-sectional size of the inner tube formed from the inner strip 9 whilst the outer tube is being formed from the strip 10, and as will be seen from the drawing the restraining member is disposed between the inner and outer strips and is supported by a bracket 230.

From Figure 6 it will be seen that the inner tube is passed through the tube 23 and does not therefore interfere with the formation of the outer tube.

When the outer tube has been folded as shown in Figure 6 the outer and inner tubes are moved into the confines of a guide passage 24 in which the inner tube is caused to expand and adhere to the inner surface of the outer tube by reason of the adhesive which has been applied to the inner surface of said outer tube.

With many materials it is found that the inner tube has sufficient resiliency to ensure that it firmly engages the inner surface of the outer tube, but if it is desired positively to press the inner tube against the inner surface of the outer tube, or if the inner strip comprises a strip of material which is of a width such that it covers a part only of the inner surface of the outer tube, a pressing member 25 may be provided. The pressing member 25 is connected to the end of the rod 16 and consists of a tubular member provided with slits 26 which are sprung apart so that as the inner and outer tubes pass between the walls of the guide passage 24 and the pressing member 25, the inner strip is positively pressed against the inner surface of the outer tube.

As shown in the drawing the pressing device is in the form of a split conical tube, the tube being so arranged that the inner strip first engages with the smaller end of the cone and is forced into contact with the outer tube as the inner and outer strips pass over the conical tube. The purpose of the rod 16 is to provide a support for the pressing member, so that if the pressing member is not used the rod 16 may be dispensed with. As shown in the drawing, the rod 16 is supported by the conical tube 25 and a bracket 160.

When the outer tube passes into the guide passage 24, the longitudinal edges of the strip 10 butt against each other as shown in Figures 7 and 8, and when the inner strip is caused to make contact with the inner surface of the outer tube, the butt joint formed by the longitudinal edges of the inner tube is covered as shown in Figures 7 and 8.

It will be seen from the various figures of the drawing that when the inner strip is formed as a tube the inner tube is arranged so that the joint of the inner tube does not occur at the same place as the joint of the outer tube, and in this manner the butt joint of the outer tube is covered by an inner strip and the outer surface of the tube so formed does not suffer the disadvantage of having a ridge such as would normally be formed if the longitudinal edges of the outer tube overlapped each other.

The continuous tube formed as above described is passed through the guide chamber 24, which is heated by heaters 28 to dry the adhesive and an endless band 27 conveys the tube beneath or through further heated elements 28 which further dries the adhesive uniting the inner strip and outer tube, and the continuous tube is then passed to cutting mechanism 29 which severs the continuous tube into tubes of the desired length. The severed tubes are then carried by a further endless band 30 to deflecting means 31 arranged to deliver the severed tubes on to a collector band 32 or to any suitable means for collecting the tubes.

The endless band 27 constitutes the means by which the strips 9 and 10 are moved in a lengthwise direction through the folding means or garnitures 15 and 22, and in order to commence the operation of the mechanism the strips 9 and 10 are fed through the garnitures 15 and 22 and the guide chamber 24 manually, until the endless band 27 controls the tube which is formed whilst the strips are being fed manually through the members above referred to. Once the endless band 27 has control of the strips the mechanism will continue to work automatically until a reel of material 11 or 12 is used up or until the paper tube which is formed by the folding mechanism should, for any reason, break.

What is claimed as the invention and desired to secure by Letters Patent is:—

1. In a machine for forming tubes the combination with means to feed a cover element for the seam of the tube, of folding elements to form a strip of material into a tube around the cover element, means to restrain the cover element from contact with the tube while the tube is being formed, mechanism to apply adhesive to at least one of those surfaces of the cover element and the strip which engage with each other in the completed tube and means to press the cover element into engagement with the inside of the tube after the folding of the tube is completed.

2. In a machine for forming tubes the combination with means to move a cover element for the seam of the tube and a strip of material in a lengthwise direction, folding elements to form the strip of material into a tube around the cover element while the cover element and strip of material are moving lengthwise, means to restrain the cover element from contact with the tube while the tube is being formed, means to apply adhesive to at least one of those surfaces of the cover element and the strip which engage with each other in the completed tube and means to press the cover element into engagement with the inside of the tube after the folding of the tube is completed.

3. In a machine for forming tubes the combination with folding elements to form a plurality of strips of material into tubes around each other, of means to restrain an inner tube from contact with the next outer tube while the tubes are being formed and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

4. In a machine for forming tubes the combination with folding elements to form a plurality of strips of material into tubes around each other, of means to restrain an inner tube from contact with the next outer tube while the tubes are being formed, means to press an inner tube against the inside of an outer tube after the tubes have been formed, and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

5. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, means to restrain an inner tube from contact with the next outer tube while the tubes are being formed, and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

6. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, means to restrain an inner tube from contact with the next outer tube while the tubes are being formed, means to press an inner tube against the inside of an outer tube after the tubes have been formed, and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

7. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, a guide disposed between an inner and an outer tube, to restrain the inner tube from contact with the outer tube while the tubes are being formed, and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

8. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, a hollow tube through which the inner tube is passed to restrain the inner tube from contact with the outer tube while the tubes are being formed, and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

9. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, a guide disposed between an inner and an outer tube to restrain the inner tube from contact with the outer tube while the tubes are being formed, means to press an inner tube against the inside of an outer tube after the tubes have been formed, and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

10. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, a hollow tube through which the inner tube is passed to restrain the inner tube from contact with the outer tube while the tubes are being formed, means to press an inner tube against the inside of an outer tube after the tubes have been formed, and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

11. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, a guide disposed between an inner and an outer tube to restrain the inner tube from contact with the outer tube while the tubes are being formed, a guide passage, a resilient member disposed within the passage said resilient member engaging the inner tube and pressing the inner tube into engagement with the inside of the outer tube while the tubes are passing through the passage, and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

12. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, a hollow tube through which the inner tube is passed to restrain the inner tube from contact with the outer tube while the tubes are being formed, a guide passage, a resilient member disposed within the passage said resilient member engaging the inner tube and pressing the inner tube into engagement with the inside of the outer tube while the tubes are passing through the passage, and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

13. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, a hollow tube through which the inner tube is passed to restrain the inner tube from contact with the outer tube while the tubes are being formed, a guide passage, a support extending through said hollow tube, a resilient member connected with the support and disposed within the passage said resilient member engaging the inner tube and pressing the inner tube into engagement with the inside of the outer tube while the tubes are passing through the passage, and means to apply adhesive to that surface of an outer tube with which an inner tube is to engage.

14. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, a guide disposed between an inner and an outer tube to restrain the inner tube from contact with the outer tube while the tubes are being formed, means to apply adhesive to that surface of an outer tube with which an inner tube is to engage, and means to sever the completed continuous tube into lengths.

15. In a machine for forming tubes the combination with means to feed a plurality of continuous strips of material lengthwise, of folding elements to form the strips into tubes around each other, a guide disposed between an inner and an outer tube to restrain the inner tube from contact with the outer tube while the tubes are being formed, means to apply adhesive to that surface of an outer tube with which an inner tube is to engage, means to dry the adhesive between the inner and outer tubes and means to sever the completed continuous tube into lengths.

16. In a machine for forming tubes the combination with folding elements to form a plurality of strips of material into tubes around each other, of means to restrain an inner tube from contact with the next outer tube while the tubes are being formed, means to apply adhesive to that surface of an outer tube with which an inner tube is to engage, and means to sever the completed continuous tube into lengths.

HAROLD BERNARDO MOLINS,
MOSES HYMAN ISAACS,
Executors of the Estate of Walter Everett Molins, Deceased.
ERNST CURT MÜHLBAUER.