This invention concerns improvements relating to hollow mouthpieces for cigarettes, to cigarettes furnished with such mouthpieces and to methods for the production thereof.

A hollow mouthpiece in accordance with the invention consists of a strip of corrugated paper or like material adherent at its crests to a flat backing strip of paper or like material and brought to a round cross section with the backing strip on the outside, the corrugations being longitudinally of the material from which the corrugated strip is produced. The backing strip thus encases and supports the corrugated strip which forms the core or filling of the mouthpiece. The mouthpiece preferably comprises also an outermost wrapping formed from a flat strip of paper or like material.

A method for the production of a hollow mouthpiece in accordance with the invention comprises corrugating a strip by passing it between two interlocked grooved plates whose grooves extend generally in the direction of movement of the strip, but which converge and become deeper from the entry to the exit side of the plates, and passing the said strip between a pair of interlocked circumferentially grooved rolls, through means for applying an adherent backing strip to the first-named strip thus longitudinally corrugated, and through means for shaping the adhering strips to bring them to a round shape with the backing strip encasing the corrugated strip. Preferably, the strips, after being brought together and formed to substantially circular shape, have a further adherent strip wrapped around them, the three strips being then finally formed to circular shape.

Apparatus for producing a hollow mouthpiece in accordance with the invention comprises two interlocked grooved plates between which a strip is passed, the grooves of the plates extending generally in the direction of movement of the strip but converging and becoming deeper from the entry to the exit side of the plates, a pair of interlocked circumferentially grooved rolls between which the strip is then passed, means for applying an adherent backing strip to the first-named strip thus longitudinally corrugated, and means for shaping the adhering strips to bring them to a round shape with the backing strip encasing the corrugated strip.

One manner of carrying the invention into effect will now be more fully described by way of example and with reference to the accompanying drawings, in which:

FIGURES 1 and 2 represent a perspective view of a complete apparatus for producing hollow mouthpiece material, FIGURE 2 being a leftward continuation of FIGURE 1.

FIGURE 3 is a perspective view, to a larger scale, of grooved paper-shaping plates (shown opened), FIGURE 4 a vertical section, also to a larger scale, of grooved paper-shaping rolls, and FIGURES 5 to 10 are cross sections on the lines V—V to X—X respectively in FIGURE 2, to an even larger scale, through the mouthpiece material at various stages of its production.

Referring to FIGURE 1, a strip 1 of paper is fed from a reel 2, around a roller 3 and over a guide roller 4, between two horizontal grooved plates 5, 6. The lower plate 5 is mounted on a frame 7 and the upper plate 6 is hinged to the plate 5 at its rear edge 8 (FIGURE 3).

The lower and upper plates 5, 6 have interfitting groove formations 9 and 10 which extend generally in the direction of movement of the strip 1, but which gradually converge and become deeper from the front, entry edge to the rear, exit edge of the respective plates. At the exit edge, the grooves are shaped to conform substantially to the finished form of the corrugations (cf. the corrugations 11 in FIGURE 5). Viewed from the exit edge, the grooves 9, 10 diverge and become shallower towards the entry edge, where they substantially disappear over the full width of the strip 1. The male and female formations of the two plates interdigitate closely, say with a gap of 0.005 inch. For the example illustrated, the grooves 9, 10, and the intermediate teeth, have at the exit edges a V-shape with an apex angle of about 45°. The pitch of the grooves may suitably be 0.135 inch and their depth 0.130 inch. Conventionally, the grooves 9 in the lower plate are formed by eight teeth standing proud of the plate, whereas eight grooves 10 are formed in the upper plate 6. The angle of convergence between the centre lines of adjacent teeth of a plate in this example may be about 1°30'. Apart from the production of the corrugations, the strip 1 is not creased, wrinkled or otherwise formed in passing between the plates 5, 6. Indeed it is caused to follow the groove formations 9, 10 of the plates without being given a permanent set.

As the corrugated strip 1 leaves the plates 5, 6, it enters between the rollers 12, 13 of the first of three pairs 14, 15, 16 of superimposed rollers all driven to run at the same speed. The rollers 12, 13, 14 of the first roller pair 14, which serves to complete and maintain the shaping of the corrugated strip 1, are both provided with groove formations 17, 18 (FIGURE 4) of cross sections similar to those 9, 10 at the exit edges of the plates 5, 6 respectively and with a similar gap 19. The pair of rollers 15 serve as drag rollers. The pair of rollers 16 serve to apply to the underside of the corrugated strip 1 a backing strip 20 which is taken from a reel 21 and guided around a roller 22 and the lower roller of the pair 16, whence it advances towards the left in FIGURE 1 together with the corrugated strip 1.

The strip 20 has a coating of a heat-sensitive and/or pressure-sensitive adhesive on the surface which comes against the underside of the corrugated strip 1 as the strips are brought together between the rollers of the pair 16. If the adhesive is heat sensitive the bottom roller of the pair 16 may be heated, for example by an embedded electrical element. From the roller pair 16, the superimposed strips pass between driven cutters 23 of known type which trim their two edges, as seen at 24 in FIGURE 5. Next the said strips pass between a pair of driven drag rollers 25.

Of the roller pairs 15, 16 and 25, only the upper roller is grooved, similarly to the roller 13. As shown in FIGURE 4, the rollers may comprise sleeves 26 of nylon or other plastic or of resin-bonded fibre or paper clamped or bonded to metal hubs 27. The webs 1 and 20 may be supported by bridges between the successive components 13, 14, 15, 16, 23 and 25. Between the roller pairs 14, 15 and 16, such bridges may be formed by ribs or tines on which the corrugations are guided. One such bridge is shown at 24 in FIGURE 1.

From the drag rollers 25, the superimposed strips 1 and 20 pass, with a twist into a vertical plane (FIGURE 5), into the funnel 28 of a known type of forming device for bringing them to a substantially tubular shape, the applied backing strip 20 serving to retain the corrugations of the strip 1. At the outlet of the funnel 28, the strips have the nearly tubular form seen in FIGURE 6, but with a gap 29, the corrugations 11 having been closed up to give the star-shape shown with substantially paral-
lateral arms extending from near the centre to the strip 20.

From this point onwards, the tubular body is supported and carried along by the upper flow of an endless conveyor tape 30 similar to a cigarette machine tape and driven and guided similarly to such a tape. As the tubular body emerges from the funnel 28, it is laid upon an outer paper wrapping strip 31 which is taken from a reel 32 and passes over the tape 30, around the roller 33 round which the said tape is guided at that end. The strip 31 is provided with heat-sensitive adhesive on the surface which comes into contact with the strip 20. The tubing of the thermo-plastic strip 31, which is partially embraced by the tape 30, next pass through a device 34 which first folds up the margins of the strip 31 to the position shown in FIGURE 7, at the same time bringing the said body to a more truly circular cross-section and then folds one of the said margins over to the position shown in FIGURE 8. The other margin is folded over in a following device 35 to bring the tubular body to the condition shown in FIGURE 9. As will be seen, there is a small gap 36 between the edges of the strip 31. In other words, the widths of the strips 20 and 31 are such that the tubular body in the condition of FIGURE 9 is oversize in relation to the strip 31 as a sheet. The folding device 35 is followed by a conventional heater iron 37 which softens the heat-sensitive adhesive on the strip 31 and attaches it to the strip 20 at each side of the gap 36, see FIGURE 9. The components 34, 35 and 37 may be of the construction of the components which perform the similar function of producing the "rod" in a cigarette-making machine, namely the tongue box, short and long folders and the steam heater with its iron.

In the present case, the "rod," having the cross-section shown in FIGURE 9, is fed into an elongated die 38 provided with a steam or electric resistance heater. The heat-sensitive adhesive is re-plasticized and the "rod" is brought by the die to the truly circular cross-section shown in FIGURE 10, which is substantially the exact size of the accurately dimensioned die. The "rod" is then insolated in the final state by passage through a cold die 39, of the same diameter as the heated die 38, which is cooled to between 0°C and -10°C to set the adhesive. Additionally, a jet of air may be passed through a device 39' to assist in the cooling process. As will be seen from FIGURE 10, the gaps 29 and 36 are closed up, the edges of the strip 31 being butt welded together at 40. The "rod" 41, issuing into a guide 42, becomes free of the tape 30, as the latter passes downwardly around a roll 43, and enters a guide 44 leading to a conventional cut-off device (not shown) which divides the said rod into single or multiple piecepoint lengths which are received by a catcher, from which they can be removed for attachment to cigarettes in known manner. Preferably the temperature of the die 38 is thermostatically controlled, for example so that the die runs at a temperature of 250° to 300°C.

The strip 1 may suitably be of offset cartridge paper, caliper 0.004 inch and width 245 inches. The strip 20 may be label paper, caliper 0.003 inch and width 1½ inches, provided with a thermoplastic adhesive based on a synthetic resin composition such as a polychlorinated resin composition. The strip 31 may be paper, caliper 0.006 inch and width 24.5 mm., provided with a double coated thermo-plastic adhesive of a type similar to or compatible with, the adhesive applied to the strip 20. The strips 1 and 20 are trimmed to a width of 24.00 mm. The gap 36 is then approximately 1 mm. wide. Both die bores have a circumference of 24.8 mm. and the final "rod" when cold, has a circumference slightly less than that of the die.

Various departures from or modifications of the above example are possible. Thus the corrugations may be of a shape different from that seen in FIGURE 5, for example with parallel flanks and semi-circular or other well-rounded crests on the side away from the strip 20 or towards both sides, or even of square shape. If desired, provision may be made for heating the plates 5, 6. The strip 20, instead of being pre-coated with adhesive, may have a hot-melt glue applied to it, before it is brought together with the strip 1, by the nozzle of a known type of gluer. The strips 1, 20 and 31 may be of thin sheet material other than paper, for example metal foil such as aluminum foil. Additionally, the strip 1 may be of various types of paper, such as glassine paper, flocked paper or metallized paper coated with a thin film of metal, and the like in then movable. The strip 20 may alternatively be applied in such a manner as to produce a helically laid backing.

We claim:

1. A method for the production of a hollow mouthpiece for a cigarette which comprises longitudinally corrugating a strip of dry flexible material by passing it between two interlateral grooved plates whose grooves extend generally in the direction of movement of said dry strip and which converge and become deeper from the entry to the exit side of the plates whereupon the strip is preliminarily corrugated and readied for subsequent bending and forming. Between a pair of interlateral circumferentially grooved rolls to further set said corrugations so as to form smooth corrugated surfaces substantially free from creases, wrinkles and tears and then applying an adhering backing strip of flexible material to said dry corrugated strip and shaping said adhering corrugated and backing strips into a cylindrical form with the backing strip encasing the corrugated strip.

2. A method as claimed in claim 1, wherein the back- ing strip is provided with heat-sensitive adhesive and the strips are heated after being brought together.

3. A method as claimed in claim 1, wherein the strips are trimmed with respect to their width after being brought together.

4. A method as claimed in claim 1, wherein the strips after being brought together are formed substantially to circular shape by being passed through a convergent funnel.

5. A method as claimed in claim 1, wherein the strips, after being brought together and formed to substantially circular shape, have a further adherent strip of flexible material wrapped around them, and the three strips are then finally formed to circular shape.

6. A method as claimed in claim 1, wherein the strips, after being brought together and formed to substantially circular shape, have a further adherent strip of flexible material wrapped around them, and the three strips are then finally formed to circular shape, the width of the further strip being less than the circumference of the substantially circular shape and the longitudinal edges of the said further strip being brought into butting relationship in the final forming to circular shape.

7. A method as claimed in claim 1, wherein the strips are formed to a final circular shape by being passed through a heated die.

8. A method as claimed in claim 1, wherein the strips are formed to a final circular shape by being passed through a heated die and then through a cooled die.

9. Apparatus for the production of a hollow mouthpiece for a cigarette, comprising two interlateral grooved plates, means for passing a strip of dry flexible material between said plates, said plates having grooves extending generally in the direction of movement of the strip and converging and becoming deeper from the entry to the exit side of said plates whereupon the strip is preliminarily corrugated and readied for subsequent and final corrugating, a pair of interlateral circumferentially grooved rolls between which said strip is passed to produce smooth corrugated surfaces substantially free from creases, wrinkles and tears, means for applying an adher-
ent backing strip of flexible material to said corrugated strip, and means for shaping said adhering strips to bring them to a round shape with said backing strip encasing said corrugated strip.

10. Apparatus as claimed in claim 9 and comprising also means for wrapping a further adherent strip of flexible material around the corrugated and backing strips after they have been brought substantially to circular shape, and means for bringing the three strips finally to circular shape.

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