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L. E. PETTITT ET AL

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METHOD OF COATING AND COILING PAPER STRIPS

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2 Sheets-Sheet 1

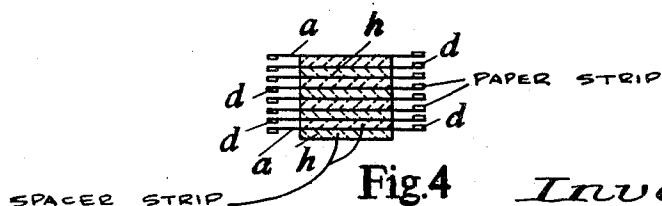
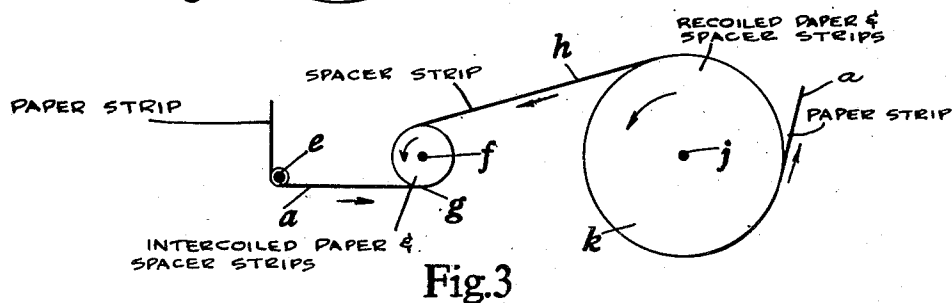
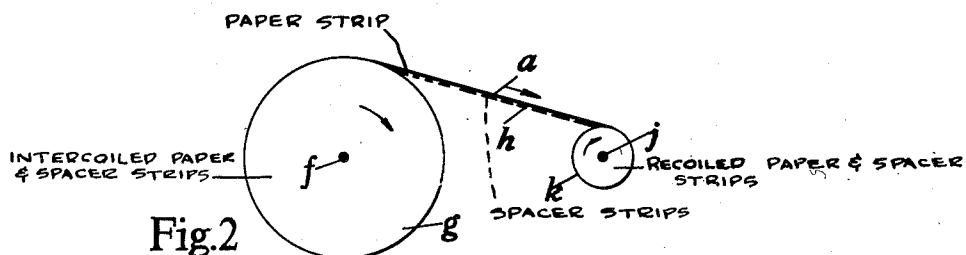
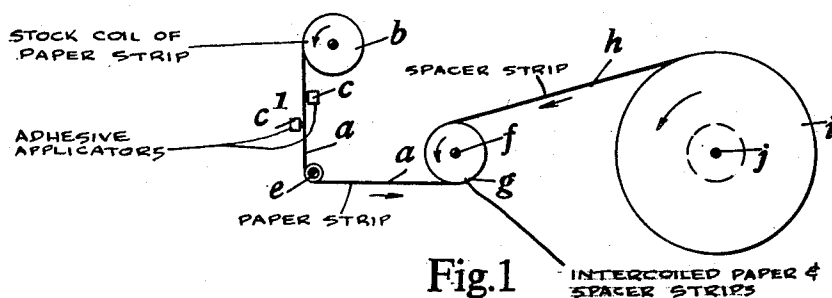


Fig. 4

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2 Sheets-Sheet 2

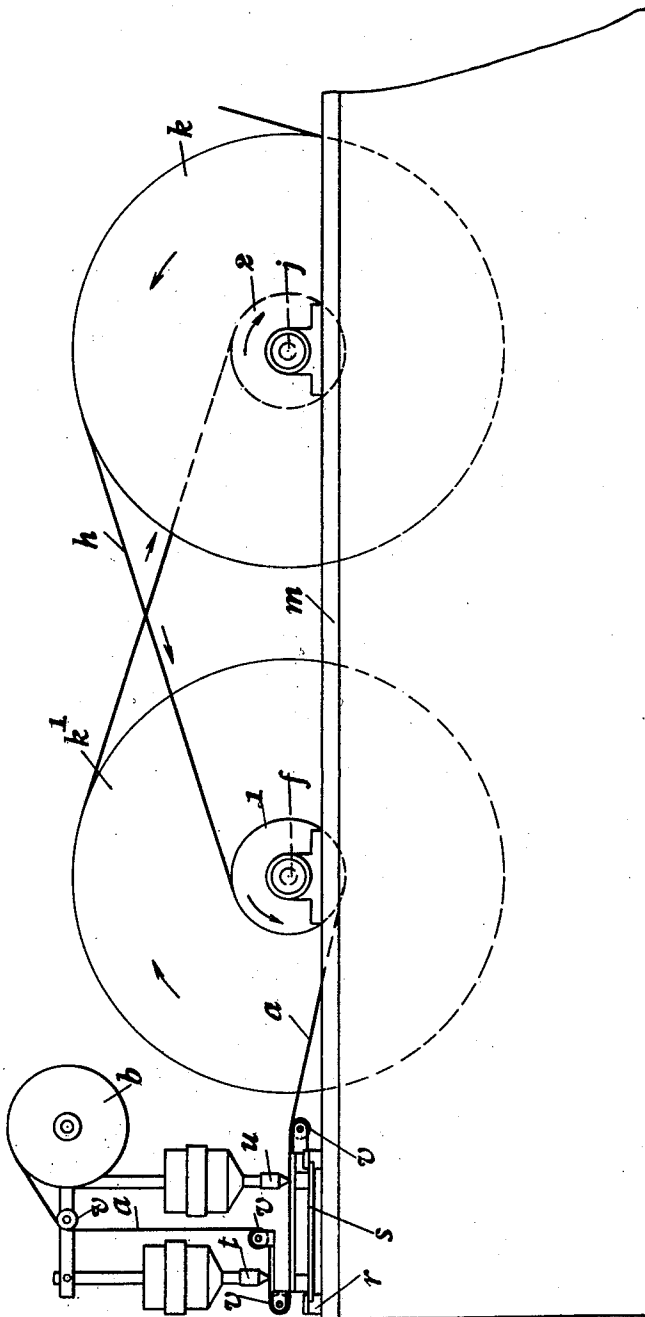


Fig. 5

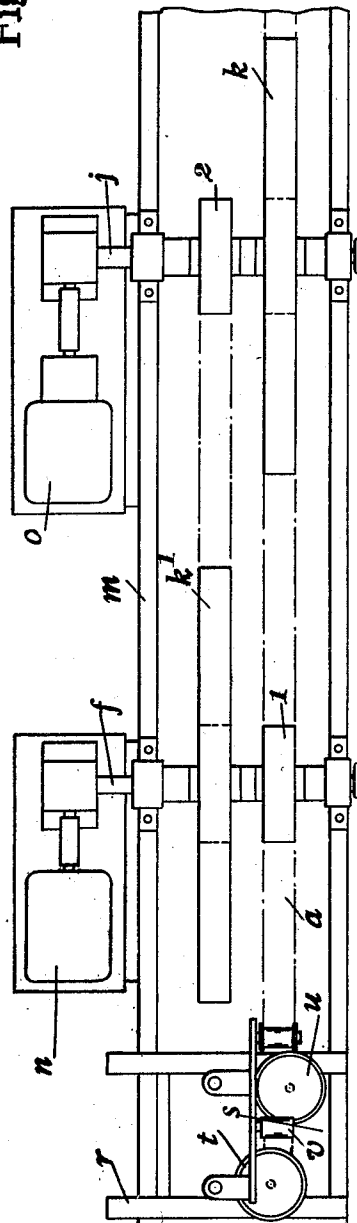


Fig. 6

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METHOD OF COATING AND COILING PAPER STRIPS

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2 Claims. (Cl. 117—44)

In the production of a form of filter made from permeable paper strips which are united at their opposite longitudinal edges by an adhesive and are coiled to a spiral form, it is required to apply a narrow layer of adhesive to one side of the strip at a position adjacent to one edge of the strip, and a similar layer to the opposite side adjacent to the opposite edge. After applying the adhesive it is required to allow it to become partially dried before combining it with another strip and coiling the two strips together to form a filter of the required spiral form. The partial drying of the adhesive is a slow procedure, and may occupy from three to four hours. This condition involves a difficulty in effecting the subsequent filter making operations at a relatively rapid rate, and the object of the present invention is to enable the difficulty to be overcome in a convenient manner.

The invention comprises a method and means in which the length of a strip to which the adhesive is to be applied is much greater than that required in a single finished filter to be produced from the strip, and is such that the time required to form a given number of filters from the strip is about equal to one half of the adhesive drying time; and in which, after the application of the adhesive thereto, the strip is first coiled at a rate which causes this operation to occupy about one half of the drying time, and is subsequently recoiled at the same rate, the re-coiled coil serving to feed the filter forming machine.

In the accompanying drawings, Figures 1, 2 and 3 illustrate diagrammatically successive stages in the coiling of paper strip in accordance with the invention.

Figure 4 is a cross section of a portion of the coiled paper strip, and an intermediate spacer strip.

Figures 5 and 6 are respectively a front elevation and plan of a machine for performing on two paper strips the operations illustrated by Figures 1-3.

In carrying the invention into effect as shown in Figures 1-4, a long permeable paper strip *a* which has been previously coiled in the form of a stock coil *b*, is first fed through any convenient apparatus *c*, *c*¹ for applying a narrow layer of adhesive *d* (Figure 4) to both sides of the strip in the positions above mentioned. From this apparatus the strip passes around a guide roller *e* (or a plurality of such rollers as shown in Figure 5) to a coiling reel on a spindle *f* which is rotated at a gradually diminishing rate, so as to maintain a uniform linear speed of the strip. The length of the strip *a*, and the rate of feed to form the coil *g* on the said reel are such that the time occupied in this operation is about equal to one half of the adhesive-drying time, that is, the time taken for the adhesive to attain a sufficiently dry condition to allow the paper strip to be fed to a filter forming machine, it being understood that the feeding of the paper strip to this machine is effected before the adhesive thereon is completely dry. In one example, this is about one and a half hours. To obviate mutual adhesion of the convolutions of the strip, a flexible spacer strip *h* of rubber or the like in the form of a coil *i* which is freely mounted

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on a spindle *j*, is simultaneously fed to the coil *g*, the strip *h* serving to hold the convolutions of the paper strip apart as shown in Figure 4. After the coil *g* has been thus formed, as shown in Figure 1, the free ends of the paper strip *a* and spacer strip *h* are attached to a reel on the spindle *j* and the strips are then recoiled to form a coil *k* as shown in Figure 2, this operation occupying the same time as the first. In the operation represented by Figure 2, the spindle *j* is rotated at a gradually diminishing rate, and the coil *g* is allowed to rotate freely on spindle *f*.

The adhesive on the recoiled coil *k* as represented by Figure 3, is now sufficiently dried to allow the paper strip *a* to be fed from the coil *k* to a filter forming machine in which successive lengths of the strip are coiled to provide the required filters as described for example, in the specification of our co-pending application Serial No. 444,283 of even date. While the strip *a* from the coil *k* (which in this stage runs freely on the spindle *j*) is being fed to the last mentioned machine the rubber or like spacer strip *h* is returned for re-use in the first coiling stage of the next paper strip as shown in Figure 3.

To obviate loss of time in feeding successive strips *a* to the filter forming machine, the apparatus for carrying out the operations above described is duplicated and the working of the two sets of apparatus is so co-ordinated that after a strip *a* has been drawn from the coil *k* in the one set, the corresponding coil *k* in the second set is ready to supply the filter-forming machine.

A convenient machine for coiling two paper strips in the manner described in the preceding paragraph is illustrated by Figures 5 and 6.

On a bed *m* are mounted two spindles *f*, *j*, these being driven by electric motors *n*, *o* through reduction gearing. Any convenient provision is made for controlling the speeds of the motors so that with increasing diameter of the coils the linear speed of the paper strips is maintained constant. Each spindle is adapted to accommodate two reels, and in combination with each spindle is provided any convenient means for clutching either of the reels to the spindles, the other reel being free.

At one end of the bed, is arranged a transverse guide *r* on which is mounted a slide *s* carrying two adhesive applicators *t*, *u*. Also on the slide are mounted guide rollers *v* for the paper strip *a*, and means for carrying the stock coil *b*, the guide rollers being arranged as shown, so that the adhesive can be applied to the opposite sides of the paper strip as above described.

By means of a preliminary operation of the machine, there are first formed on one pair of reels, two coils *k*, *k*¹ each consisting of a paper strip to which the adhesive has been applied, and an intercoiled spacer strip. One of these coils is mounted freely on the spindle *j* and the other *k*¹ is freely mounted on the spindle *f*. Empty reels, indicated by 1, 2, are also mounted on and are clutched to the said spindles.

Starting with the adhesive applicators in line with the reel, as shown in Figure 6, and with both spindles in action, a paper strip *a* is drawn from the stock coil *b* and after passing the adhesive applicators is coiled on reel 1. At the same time the spacer strip *h* is drawn from the coil *k* and is intercoiled with the paper strip on reel 1, and the paper strip on coil *k* is simultaneously drawn from the coil *k* and passed on to the filter forming machine, such as that forming the subject of our aforesaid co-pending application. While the above operation is in progress, the paper and spacer strips on coil *k*¹ are transferred to and recoiled on reel 2.

After the combined paper and spacer coil has been formed on reel 2, the slide carrying the adhesive applicators is moved to its other position in line with the now empty reel on spindle *f*. This reel is now clutched to

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the spindle *f*, and reel 1 is released. Paper is now drawn from the stock reel and the above described operation is then repeated, the paper strip on reel 2 being transferred to the filter forming machine, while the spacer strip is being intercoiled with the paper coil being formed on the spindle *f*. Simultaneously, the combined paper and spacer coil on spindle *f* is transferred to the empty reel on spindle *j*.

By the procedure above described, the adhesive applied to the paper strips becomes sufficiently dried to allow of their being transferred to the filter forming machine, and continuity of the supply of strips to the said machine is obtained in a convenient manner.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. A method of coiling permeable paper strip to each side of which a narrow layer of adhesive has been applied so that the two layers of adhesive lie adjacent to opposite edges of the strip, and which is required for subsequent use in a filter forming machine, consisting in coiling on a first rotary support a first length of the paper strip several times greater than the length required in a single finished filter to be produced from the strip, the coiling being effected whilst the adhesive on the strip is drying, and at a rate which causes the coiling operation to be completed in about one half of the adhesive drying time, intercoiling with the paper strip, during the coiling operation, a spacer strip fed from a second rotary support,

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recoiling the coiled paper strip with the intercoiled spacer strip on the second rotary support at the same rate as the coiling operation on the first rotary support and whilst the adhesive on the paper strip is still drying, feeding the recoiled paper strip before the adhesive thereon is completely dry to the filter forming machine whilst removing the spacer strip, and intercoiling the spacer strip with a second and similar length of the paper strip being coiled on the first rotary support.

2. A method according to claim 1, consisting in coiling a third and similar length of the paper strip, whilst the adhesive thereon is drying, on the first rotary support during recoiling of the first length of paper strip on the second rotary support, and at the same time intercoiling with the third length of paper strip a second spacer strip from the second rotary support, recoiling the third length of paper strip, whilst the adhesive thereon is still drying, on the second support whilst the first length of paper strip is being fed to the filter forming machine, feeding the recoiled third length of paper strip before the adhesive thereon is completely dry to the filter forming machine whilst removing the second spacer strip, and intercoiling the second spacer strip with a fourth and similar length of the paper strip being coiled on the first rotary support.

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