

March 6, 1951

L. H. MACKAY ET AL  
METHOD OF WEAVING PILE CARPETS  
AND RESULTANT PRODUCT

2,544,338

Filed June 8, 1948

3 Sheets-Sheet 1

FIG. 1.

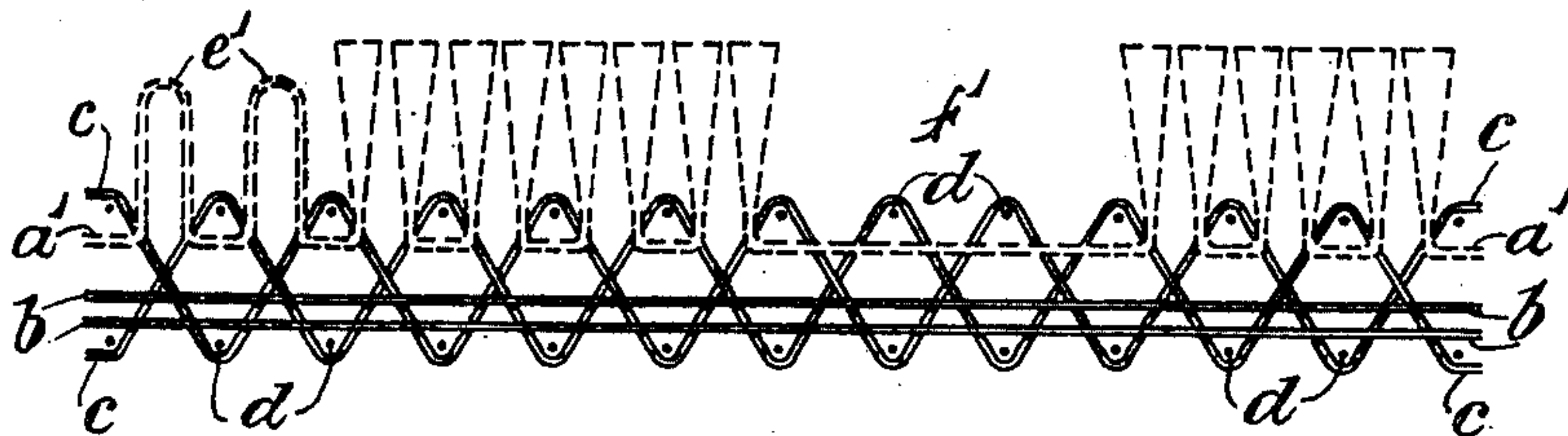


FIG. 2.

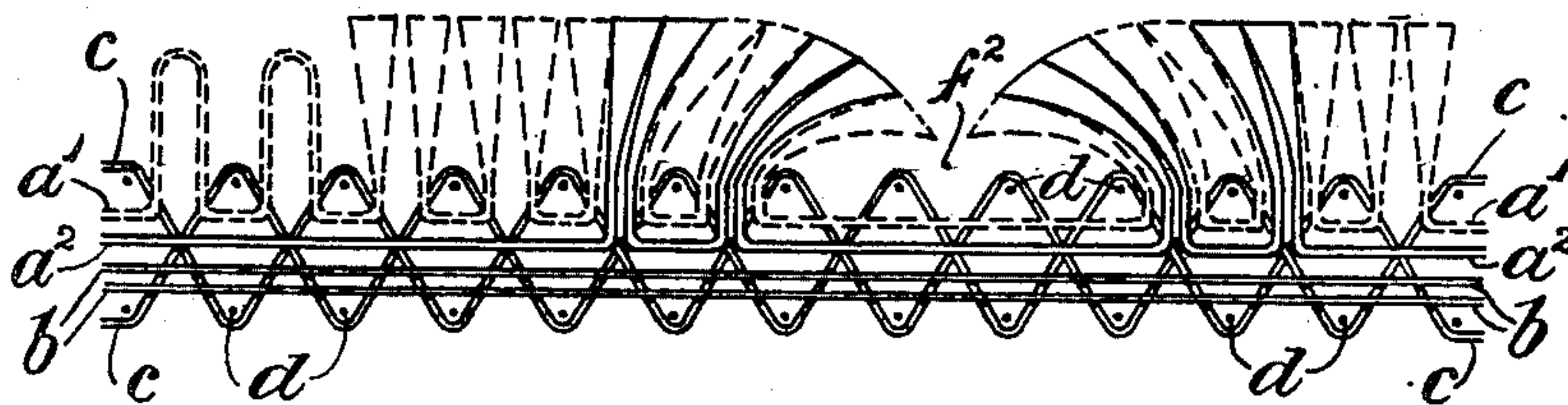


FIG. 3.

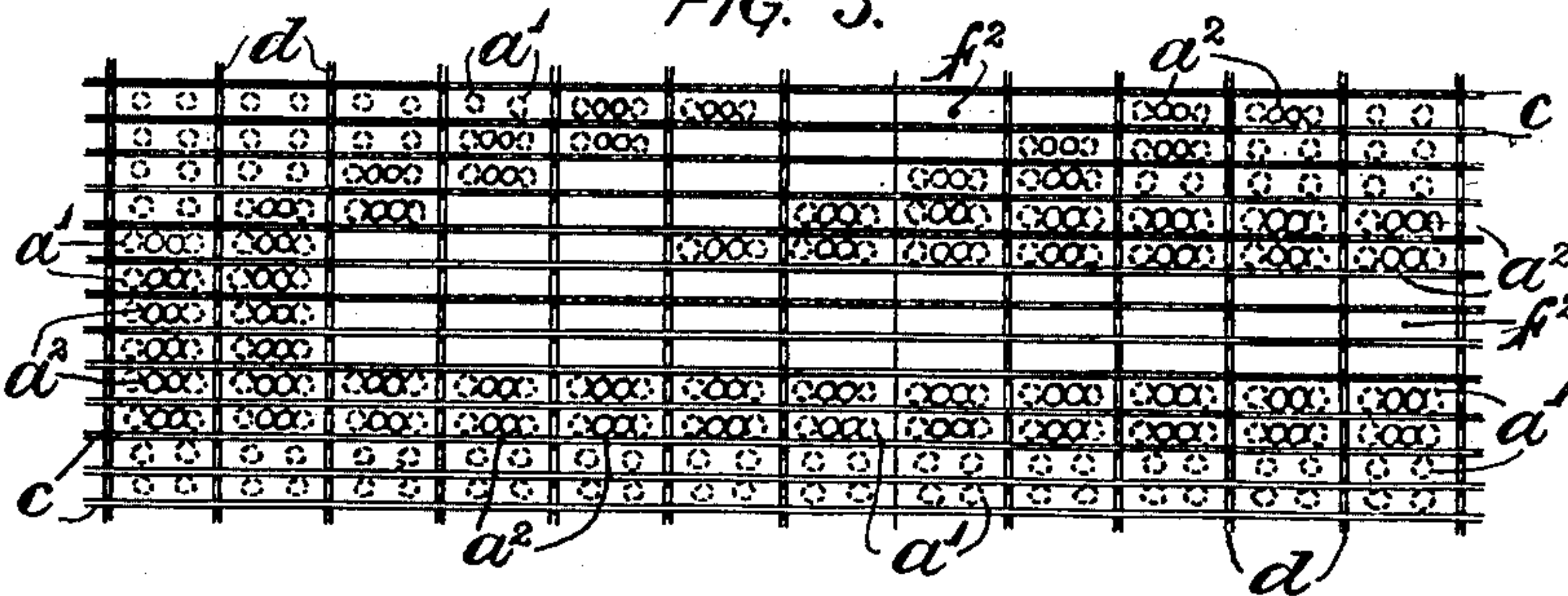
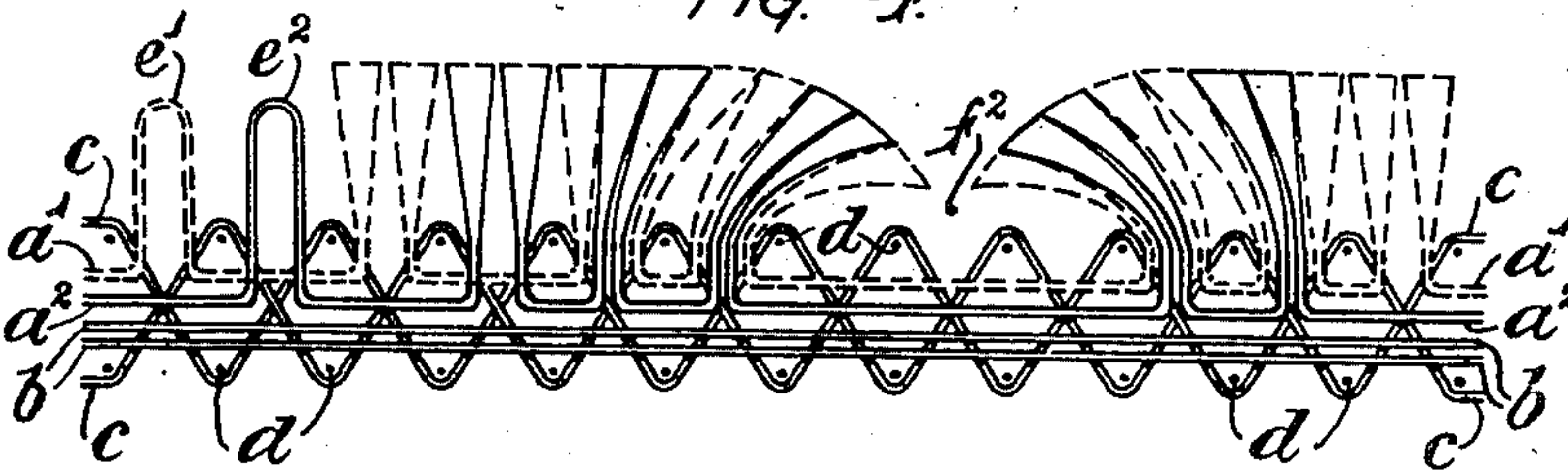


FIG. 4.



Laurence Hugh Mackay &  
John Mackay  
By Draser, Myers Manley  
Attys.

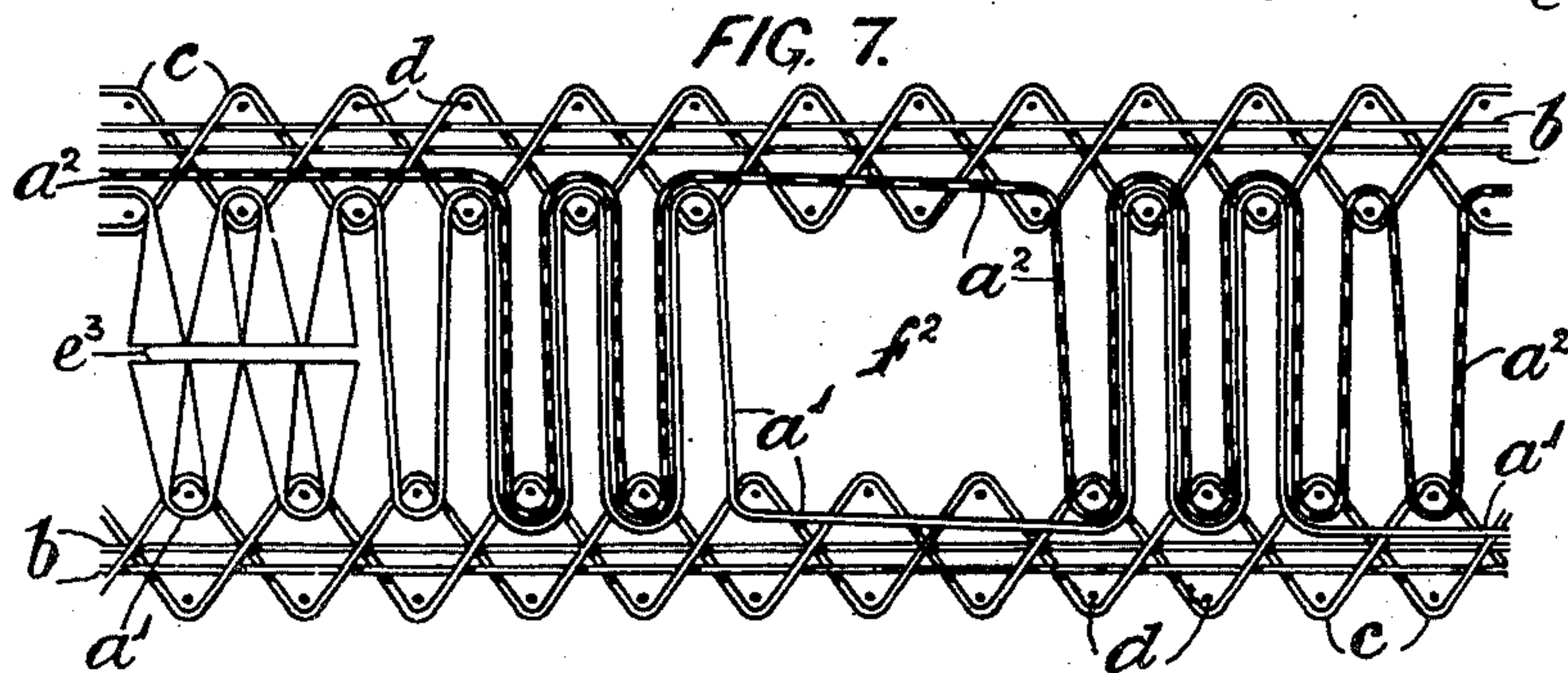
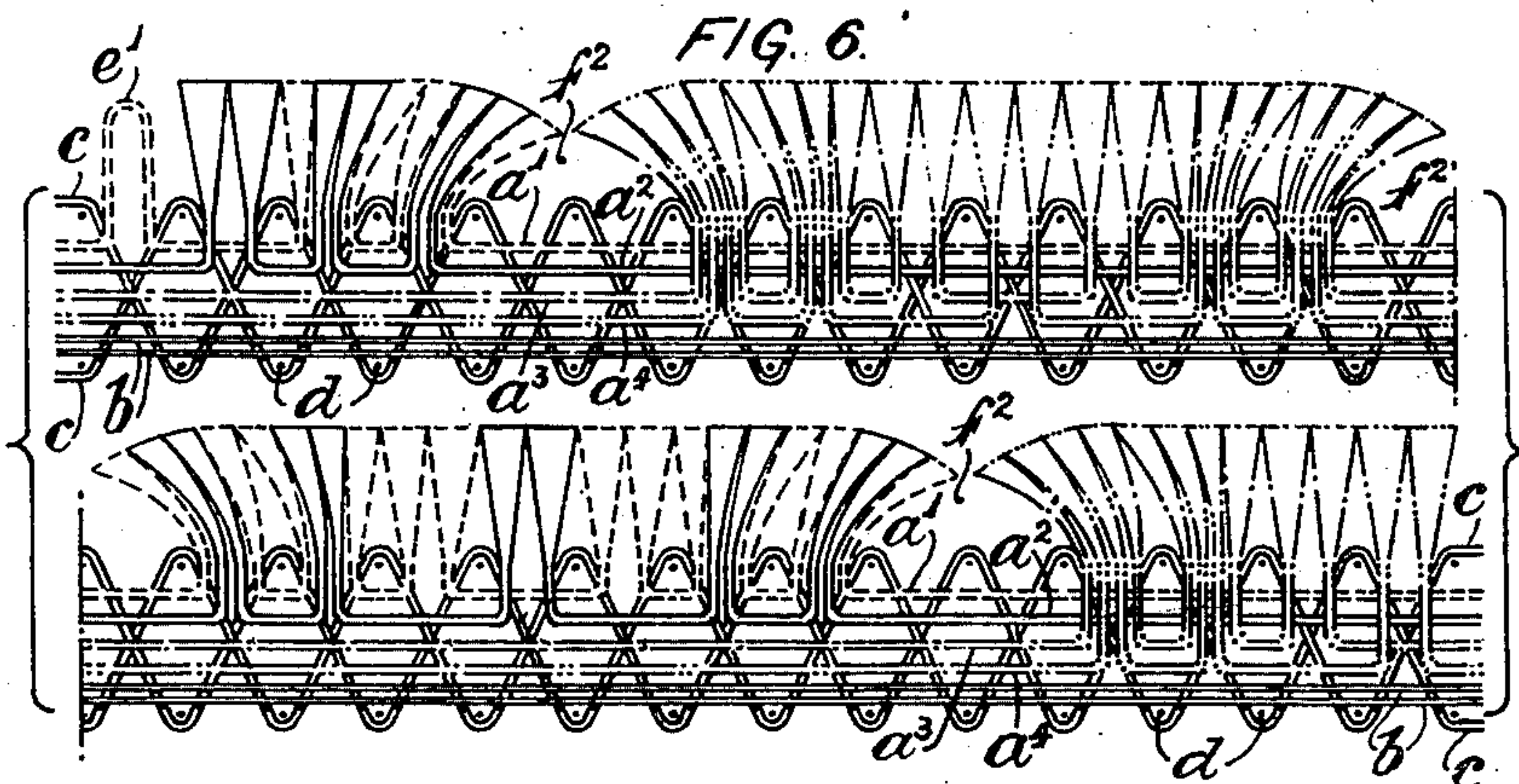
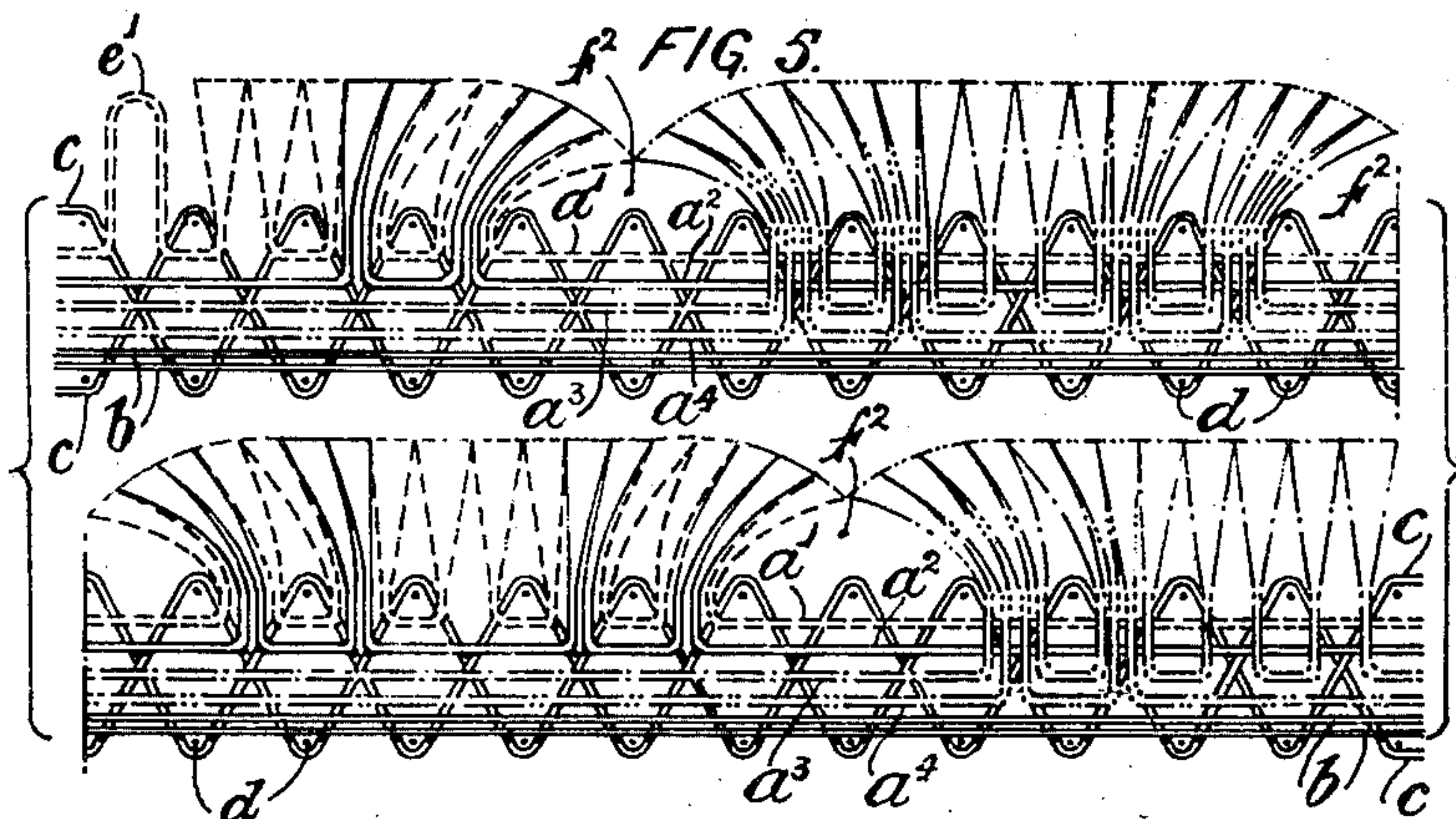
March 6, 1951

L. H. MACKAY ET AL  
METHOD OF WEAVING PILE CARPETS  
AND RESULTANT PRODUCT

2,544,338

Filed June 8, 1948

3 Sheets-Sheet 2



Laurence Hugh Mackay &  
John Mackay  
By Fraser, Myers & Manley  
Att'ys.



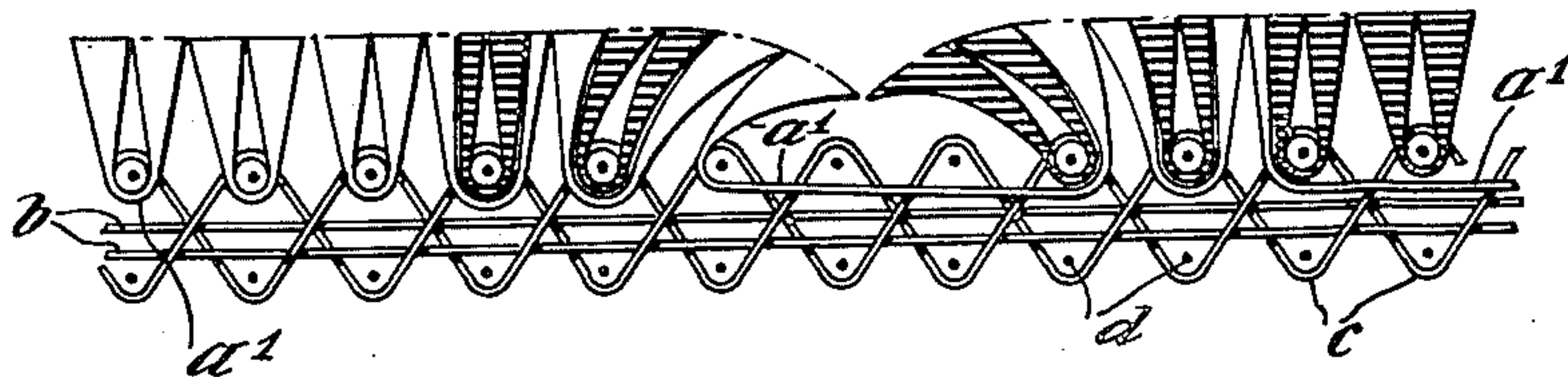
March 6, 1951

L. H. MACKAY ET AL  
METHOD OF WEAVING PILE CARPETS  
AND RESULTANT PRODUCT

2,544,338

Filed June 8, 1948

3 Sheets-Sheet 3



*Fig. 8.*

Laurence Hugh Mackay &  
John Mackay  
By Draper, Myers & Manley  
Attys.

## UNITED STATES PATENT OFFICE

2,544,338

METHOD OF WEAVING PILE CARPETS AND  
RESULTANT PRODUCTLaurence Hugh Mackay and John Mackay,  
Durham, EnglandApplication June 8, 1948, Serial No. 31,706  
In Great Britain November 3, 1947

17 Claims. (Cl. 139—406)

1

This invention relates to the manufacture of pile carpets, floor rugs and mats, and has for its object to produce in machine-made carpets and the like similar "carved" effects to those obtained in Chinese and other hand-made carpets, usually by cutting grooves or channels in the pile surfaces around and in the flowers or other parts of the design, or in the plain surface of the pile to produce a design.

Whereas in Chinese carpets the cut grooves are usually of V-section, the grooves or channels hitherto obtained in machine-made carpets have usually been formed by omitting selected pile loops thereby unavoidably producing channels of parallel-sided section. If the machine-made channels are wide, the pileless back or foundation of the carpet at the bottom of the channels is visible from vertically above, which is objectionable as detracting from the appearance of the carpet. On the other hand, if the machine-made channels are narrow, they can scarcely be seen and the "carved" effect aimed at is largely lost.

The present invention therefore is designed to produce grooves or channels in the pile surface of a machine-made carpet, rug or mat which present as nearly as possible the effect of V-section grooves or channels.

In designing a carpet it is usual to start by making a plan of the pattern or squared paper, each interstice in the upper surface of the foundation of the carpet being represented by one square on the paper. The term "interstice" is used to define the space in the upper surface of the carpet through which the pile warp threads are drawn to form the pile. A Wilton carpet has a foundation made up of upper and lower weft threads running across the loom and chain warp threads running in pairs. Body is given to the carpet foundation by stuffer warp threads varying in number according to the substance desired. In a Wilton carpet therefore each interstice is bounded by two adjacent upper weft threads and two adjacent pairs of chain warp threads. It is of course understood that any pile-forming warp threads not being used for forming pile are carried through the foundation between the upper and lower weft threads which are bound together by the chain warp threads.

In the accompanying diagrammatic drawings,

Fig. 1 is a lengthwise section of a portion of a Wilton type carpet having a parallel-sided channel formed in the pile surface according to known practice by using a single frame and stamping the Jacquard cards to lift the pile-forming warp threads to form pile tufts where required and to

2

omit the lifting of said pile-forming warp threads where a channel is wanted, a single row of pile tufts being shown.

Figs. 2, 4, 5 and 6 are lengthwise sections similar to Fig. 1 of examples of Wilton type carpets in accordance with our invention; and

Fig. 3 is a diagrammatic plan view of a portion of carpet wherein the pile tufts in the first row represented are disposed as shown in Fig. 2.

Fig. 7 is a lengthwise section showing the application of our invention to a carpet produced on a double cloth loom.

Fig. 8 shows the same portion of the carpet seen in Fig. 7 after separation is completed.

In the drawings,  $a^1$ ,  $a^2$ ,  $a^3$  and  $a^4$  represent the different pile-forming warp threads employed,  $b$ ,  $b$  represent the stuffer warp threads which combine with the unraised pile-forming warp threads to give body to the back or foundation of the carpet.  $c$ ,  $c$  represent the chain warp threads, and  $d$ ,  $d$  indicate the weft threads.

In Fig. 1, the pile tufts of the carpet are produced by cutting the loops (shown at  $e^1$ ) formed by drawing single pile-forming warp threads  $a^1$  (shown by broken lines) which come through each interstice in the foundation, and  $f^1$  is a channel formed by omitting to draw loops of pile-forming warp threads through three consecutive interstices. It will be observed that all the pile tufts in this example, including those on each side of the channel, are formed by drawing a single pile-forming thread through each interstice, the result being a channel of parallel-sided section the sides of which are, however, too erect when the carpet leaves the loom to produce the desired effect.

The present invention resides in the method of weaving a patterned pile carpet wherein the pattern is formed by providing the upper surface of the carpet foundation with normal pile areas, pile-bare areas, and denser than normal pile areas, each bare area having along at least part of its boundary a complementary pile area denser than an adjacent pile area further removed from said pile-bare area, which denser pile area is formed by drawing a thicker mass of pile-forming warp yarn through each interstice of said denser pile area than is drawn through each interstice of a normal pile area whereby some or all of the following advantages are achieved, namely, a more pronounced pattern is obtained, a better carved effect produced, the bare areas are less likely to show the foundation, the thinning out effect at the edges of the pile-bare areas normally present in machine made carpets which simulate



the carved effect is avoided and greater wearing qualities secured.

In the manufacture of a carpet having pile tufts and a channel  $f^2$  as represented in Figs. 2 and 3, the Jacquard cards are stamped as for two frames, namely, one frame which provides the main pile-forming warp threads  $a^1$  shown in broken lines, and a second frame which provides the pile-forming warp threads  $a^2$  (shown in full lines) which are used to double or increase the density of the warp threads in the two interstices immediately adjacent to the edges of the channel. The channel  $f^2$  in the pile is produced when the Jacquard cards (which are stamped in accordance with the required design) do not cause the lifting of either of the two pile-forming warp threads  $a^1$  or  $a^2$ . As the space in each of said interstices is more fully occupied than in the known example illustrated in Fig. 1 because of the duplication of the pile-forming threads, the threads next the channel are forced or subsequently caused to fall over as indicated when the pile loops are cut. The falling-over of the unsupported threads adjacent to the channel produces a very similar effect to the V-section grooves of a Chinese carpet by creating a shadow in the channel and at the same time preventing the pileless back or foundation of the carpet from being seen in said channel.

We have obtained particularly good effects by arranging the pile-forming loops as shown in Fig. 4 wherein the loops  $e^1$  formed by the warp threads  $a^1$  shown in broken lines alternate with the loops  $e^2$  formed by the warp threads  $a^2$  shown in full lines, except when they are combined to double or increase the density of the warp threads in the two interstices on each side of the channel  $f^2$ , but we make no claim to the alternation of the warp threads  $a^1$  and  $a^2$  except as constituting one way of drawing a thicker mass of threads of pile-forming yarn through the interstices on each side of the channel. We also make no claim to a carpet having channels where doubled or trebled pile-forming yarn is used uniformly throughout the pile. This known practice results equally in the formation of a carpet similar to that shown in Fig. 1, the only difference being that twice or thrice as many thinner tufts are uniformly distributed over the surface in place of the usual uniform thicker tufts. In a carpet in accordance with our invention, we purposely vary the thickness of the mass of threads of pile-forming yarn in the tufted areas and make the density of the pile tufts in the interstices along either or both margins of each channel greater than normal density.

Figs. 1 to 4 illustrate examples wherein the pile-forming warp threads are of one color, but, by employing additional frames operated as herein described, two or more colors may be used. Examples of the use of threads  $a^1$  and  $a^2$  (indicated in broken and full lines respectively) of one color and threads  $a^3$  and  $a^4$  (indicated in single and double dot and dash lines respectively) of another color are shown in Figs. 5 and 6, the double warp threads in the two interstices on each side of the channel  $f^2$  being obtained as in the example shown in Figs. 2 and 3 and in Fig. 4, respectively.

Carpets are sometimes manufactured in pairs by the face to face method. Instead of forming loops over a wire and then cutting the loops, the pile is formed in the manner shown in Fig. 7 by drawing the pile-forming threads backwards and forwards between the two carpet foundations. The two carpets thus formed are separated in the loom as they are formed by cutting mecha-

nism which severs the pile threads midway between the foundations. In Fig. 7 some of the pile-forming warp threads  $a^1$  at the left hand side of the figure are shown severed medially allowing the threads to open out into tufts as shown at  $e^3$ . This method of manufacture has certain advantages in that, when working a pattern in several colors, the colors not actually being used for the pile formation can be divided between the two carpet foundations. The two carpets, when finished, would appear to be identical to look at, but, if complementary areas of their foundations were examined, it would be found that only some of the color threads were carried through in the foundation of one carpet whilst the remaining color threads would only be found in the foundation of the complementary carpet, and vice versa. This construction enables economy to be effected in the pile yarn, but the loom for carrying out this method is more complicated.

However, this method can usefully be employed in carrying out the present invention and it will be seen in Fig. 7 that the pile-forming warp threads  $a^1$  and  $a^2$  alternately zigzag between the foundations of the two carpets and are combined in the two interstices on each side of the channel  $f^2$  to form pile tufts of double density. The warp threads  $a^1$ ,  $a^2$ , where they do not form pile loops, are shown carried in the foundations of the carpets, one in each foundation, along with the stuffer warp threads  $b$  and chain warp threads  $c$ , the threads being carried in each foundation alternately.

It will be noted also that in the channels  $f^2$  the warp threads  $a^2$  are in the foundation of the upper carpet and the warp threads  $a^1$  are in the foundation of the lower carpet.

This arrangement of the pile-forming yarn is done in order to balance the two carpets as nearly as possible but it has one small disadvantage, namely, that in each carpet at the borders of the pile bare area  $f^2$  the interstice at one border has only one pile thread drawn through it whilst at the other border the interstice has three pile threads through it. In effect, therefore, the carpet shown in Fig. 8 has four densities of tufted areas in addition to the pile-bare areas. In other words there are the normal pile areas with two pile threads through each interstice, two denser than normal pile areas, i. e., a much denser than normal pile area in which there are four pile threads through each interstice and a slightly denser than normal pile area in which there are only three pile threads in each interstice and finally a less dense than normal pile area in which there is only one thread in each interstice. The production of the slightly denser than normal pile area and the less dense than normal pile area is only the result of attempting to make the two carpets substantially equal in weight and quality of foundation. It would be perfectly simple to carry both the pile-forming threads  $a^1$  and  $a^2$  through the one foundation and the result would then be that the pile-bare areas  $f^2$  would be bordered at one side by interstices having four pile threads through each interstice whilst the other edge would be bordered by a single row of interstices having two pile threads through them, i. e., as in a normal density pile area but this would not matter since the next row of interstices would be of interstices having four pile threads therethrough.

The accompanying drawings show a two-shot



weft, but our invention is equally applicable to a three-shot weft.

It will also be understood that the pile-forming warp threads  $a^1$ ,  $a^2$ ,  $a^3$  and  $a^4$  may be trebled instead of doubled, and the doubled or trebled threads can be extended to any number of interstices on either or on each side of the channels  $f^2$ , the number of double or treble threads being determined by the depth of the pile and/or by the type of design.

While we have shown and described several embodiments of our invention, it is to be understood that we do not wish to be limited to the specific method and means described since other means may be employed for accomplishing the same desired ends without departing from the spirit of the invention as defined in the appended claims.

What we claim is:

1. In the method of weaving a patterned pile carpet in which the pile is produced by drawing threads of pile-forming warp yarn through the interstices formed between adjacent pairs of chain warp threads and adjacent weft threads constituting the upper surface of the carpet foundation, which pile threads are subsequently cut to form the pile, the steps which comprise forming the pattern by providing the upper surface of the carpet foundation with normal pile areas, pile-bare areas and denser than normal pile areas, and positioning the denser than normal pile areas along at least part of the boundary of a pile-bare area and between the pile-bare area and a normal pile area, said denser than normal pile area being formed by drawing a thicker mass of threads of pile-forming warp yarn through each interstice of said denser pile area than is drawn through each interstice of a normal pile area.

2. In the method of weaving a patterned pile carpet in which the pile is produced by drawing threads of pile-forming warp yarn through the interstices formed between adjacent pairs of chain warp threads and adjacent weft threads constituting the upper surface of the carpet foundation, which pile threads are subsequently cut to form the pile, the steps which comprise forming the pattern by providing the upper surface of the carpet foundation with normal pile areas, pile-bare areas and denser than normal pile areas, and positioning the denser than normal pile areas along at least part of the boundary of a pile-bare area and between the pile-bare area and a normal pile area, said denser than normal pile area being formed by drawing a greater number of pile threads through each interstice of said denser pile area than is drawn through each interstice of a normal pile area.

3. In the method of weaving a patterned pile carpet in which the pile is produced by drawing loops of pile-forming warp yarn through the interstices formed between adjacent pairs of chain warp threads and adjacent weft threads constituting the upper surface of the carpet foundation, which pile loops are subsequently cut to form the pile, the steps which comprise forming the pattern by providing the upper surface of the carpet foundation with normal pile areas, pile-bare areas and denser than normal pile areas, and positioning the denser than normal pile areas along at least part of the boundaries of a pile-bare area and between the pile-bare area and a normal pile area, said denser than

normal pile area being formed by drawing a thicker mass of loops of pile-forming warp yarn through each interstice of said denser pile area than is drawn through each interstice of a normal pile area.

4. In the method of weaving a patterned pile carpet in which the pile is produced by drawing loops of pile-forming warp yarn through the interstices formed between adjacent pairs of chain warp threads and adjacent weft threads constituting the upper surface of the carpet foundation, which pile loops are subsequently cut to form the pile, the steps which comprise forming the pattern by providing the upper surface of the carpet foundation with normal pile areas, pile-bare areas and denser than normal pile areas, and positioning the denser than normal pile areas along at least part of the boundaries of a pile-bare area and between the pile-bare area and a normal pile area, said denser than normal pile area being formed by drawing a greater number of pile loops through each interstice of said denser pile area than is drawn through each interstice of a normal pile area.

5. In the method of weaving a patterned pile carpet in which the pile is produced by drawing pile-forming warp yarn through the interstices formed between adjacent pairs of chain warp threads and adjacent weft threads constituting the upper surface of the carpet foundation, the steps which comprise forming the pattern by providing the upper surface of the foundation with normal pile areas, pile-bare areas and denser than normal pile areas, and positioning the denser than normal pile area along at least part of the boundary of a pile-bare area and between the pile-bare area and a normal pile area, said denser than normal pile area covering at least two rows of interstices and being formed by drawing a thicker mass of pile-forming warp yarn through each interstice of said rows than is drawn through each interstice of a normal pile area.

6. In the method of weaving a patterned pile carpet in which the pile is produced by drawing threads of pile-forming warp yarn through the interstices formed between adjacent pairs of chain warp threads and adjacent weft threads constituting the upper surface of the carpet foundation, which pile threads are subsequently cut to form the pile, the steps which comprise forming the pattern by providing the upper surface of the carpet foundation with normal pile areas, channel shaped pile-bare areas and denser than normal pile areas, and positioning the denser than normal pile area along both boundaries of the channel between the pile-bare area and a normal pile area, said denser than normal pile area being formed by drawing a thicker mass of threads of pile-forming warp yarn through each interstice of said denser pile area than is drawn through each interstice of a normal pile area.

7. In the method of weaving a patterned pile carpet in which two pile-forming warp yarns are used and in which the pile is produced by drawing loops of pile-forming warp yarn through the interstices formed between adjacent pairs of chain warp threads and adjacent weft threads constituting the upper surface of the carpet foundation, which pile loops are subsequently cut to form the pile, the steps which comprise forming the pattern by providing the upper surface of the carpet foundation with normal pile areas by drawing up a loop of one of the pile-forming



warp yarns through each interstice, pile bare areas, and denser than normal pile areas by drawing of a loop of both pile-forming warp yarns through each interstice, and positioning the denser than normal pile areas along at least part of the boundary of a pile-bare area and between the pile-bare area and a normal pile area.

8. In the method of weaving a patterned pile carpet in which two pile-forming warp yarns are used and in which the pile is produced by drawing loops of pile-forming warp yarn through the interstices formed between adjacent pairs of chain warp threads and adjacent weft threads constituting the upper surface of the carpet foundation, which pile loops are subsequently cut to form the pile, the steps which comprise forming the pattern by providing the upper surface of the carpet foundation with normal pile areas by drawing up a loop of the same pile-forming warp yarns through each interstice, pile-bare areas, and denser than normal pile areas by drawing up a loop of both pile-forming warp yarns through each interstice, and positioning the denser than normal pile areas along at least part of the boundary of a pile-bare area and between the pile-bare area and a normal pile area.

9. In the method of weaving a patterned pile carpet in which two pile-forming warp yarns are used and in which the pile is produced by drawing loops of pile-forming warp yarn through the interstices formed between adjacent pairs of chain warp threads and adjacent weft threads constituting the upper surface of the carpet foundation, which pile loops are subsequently cut to form the pile, the steps which comprise forming the pattern by providing the upper surface of the carpet foundation with normal pile areas by drawing up a loop of alternate pile-forming warp yarns through each alternate interstice, pile-bare areas and denser than normal pile areas by drawing up a loop of both pile-forming warp yarns through each interstice, and positioning the denser than normal pile areas along at least part of the boundary of a pile-bare area and between the pile-bare area and a normal pile area.

10. In the method of weaving carpets by the double-cloth method employing two sets of weft threads, two sets of stuffer warp threads and two sets of chain warp threads, thus forming the bases for two carpets, passing one pile warp thread through selected interstices in each base to form normal pile areas, leaving other selected interstices blank so as to form pile-bare area channels in the pile, passing a second warp thread through the interstices between said channels and a normal pile area to form a denser than normal pile area, and separating the two carpets thus formed by cutting the pile warp threads.

11. In the method of claim 10 wherein one pile warp thread is utilized to form the normal pile area on one side of a channel and the second warp thread forms the normal pile area on the other side of the channel.

12. A carpet having a foundation of weft threads, stuffer warp threads and chain warp threads and a pile formed by pile threads passing through interstices in the foundation between said weft threads, the density of the pile being varied so that in some areas the interstices have four pile threads passing through, in other areas the interstices have only two pile threads passing through and in still further areas the interstices have no pile threads passing through, and in re-

spect to such last mentioned areas only one pile-forming thread is carried through the foundation with the stuffer warp threads, each area through the interstices of which no pile threads pass having along at least a part of its boundary and between it and an area through the interstices of which two pile threads pass, a denser area through the interstices of which four pile threads pass.

13. A patterned pile carpet comprising a carpet foundation having interstices formed by chain warp threads and weft threads, and a patterned pile formed by pile-forming warp yarn passing through interstices in the foundation and providing normal pile areas, pile-bare areas, and denser than normal pile areas, each pile-bare area having at least along part of its boundary a complementary pile area denser than an adjacent pile area further removed from said pile-bare area, said denser pile area being provided by a thicker mass of pile-forming yarn passing through each interstice of said denser pile area than through each interstice of a normal pile area.

14. A patterned pile carpet comprising a carpet foundation having interstices formed by chain warp threads and weft threads, and a patterned pile formed by threads of pile-forming warp yarn passing through interstices in the foundation and providing normal pile areas, pile-bare areas, and denser than normal pile areas, each pile-bare area having at least along a part of its boundary a complementary pile area denser than an adjacent pile area further removed from said pile-bare area, said denser pile area being provided by a greater number of pile-forming threads of yarn passing through each interstice of said denser pile area than through each interstice of a normal pile area.

15. A patterned pile carpet comprising a carpet foundation having interstices and a patterned pile having normal pile areas, pile-bare areas and denser than normal pile areas, the denser than normal pile areas forming a complementary boundary for at least part of a pile-bare area and being disposed between the pile-bare area and a normal pile area farther removed from said pile-bare area.

16. A patterned pile carpet according to claim 15 wherein the denser than normal pile areas are provided by thicker masses of pile-forming yarn extending through each interstice of the carpet foundation at said denser than normal pile areas than through each interstice of the carpet foundation at the normal pile areas.

17. A patterned pile carpet according to claim 16 wherein the denser than normal pile area is provided by a thicker mass of pile-forming yarn extending through at least two rows of interstices adjacent both margins of each of said pile-bare areas.

LAURENCE HUGH MACKAY.  
JOHN MACKAY.

#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

Number	Name	Date
1,849,550	Phoenix	Mar. 15, 1932
2,163,135	Shuttleworth	June 20, 1939
2,179,375	Matthews	Nov. 7, 1939
2,227,573	Clarke	Jan. 7, 1941
2,235,732	Sudell	Mar. 18, 1941