

Nov. 17, 1953

W. F. ENCHELMAIER

2,659,632

METHOD OF MAKING BRUSHES

Filed Feb. 9, 1948

2 Sheets-Sheet 1

Fig. 1.

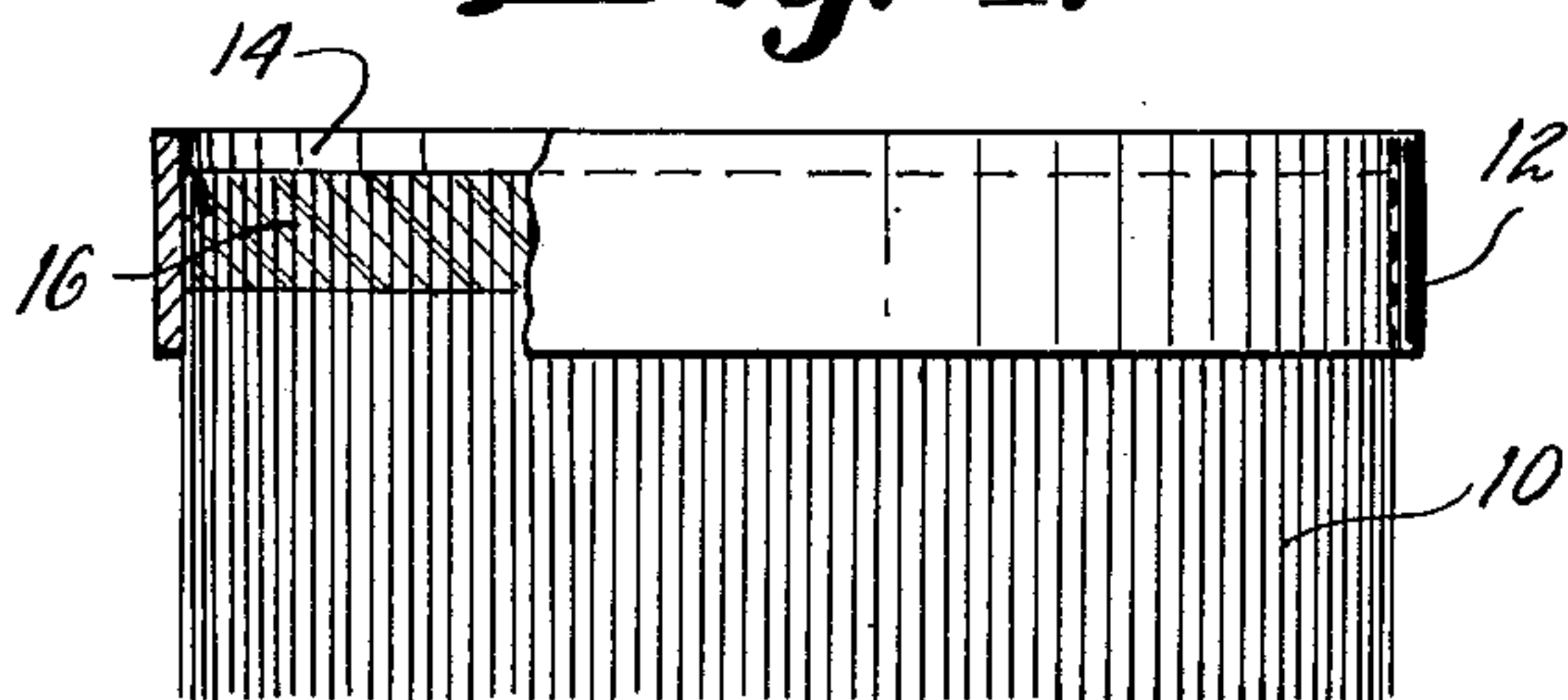


Fig. 3.

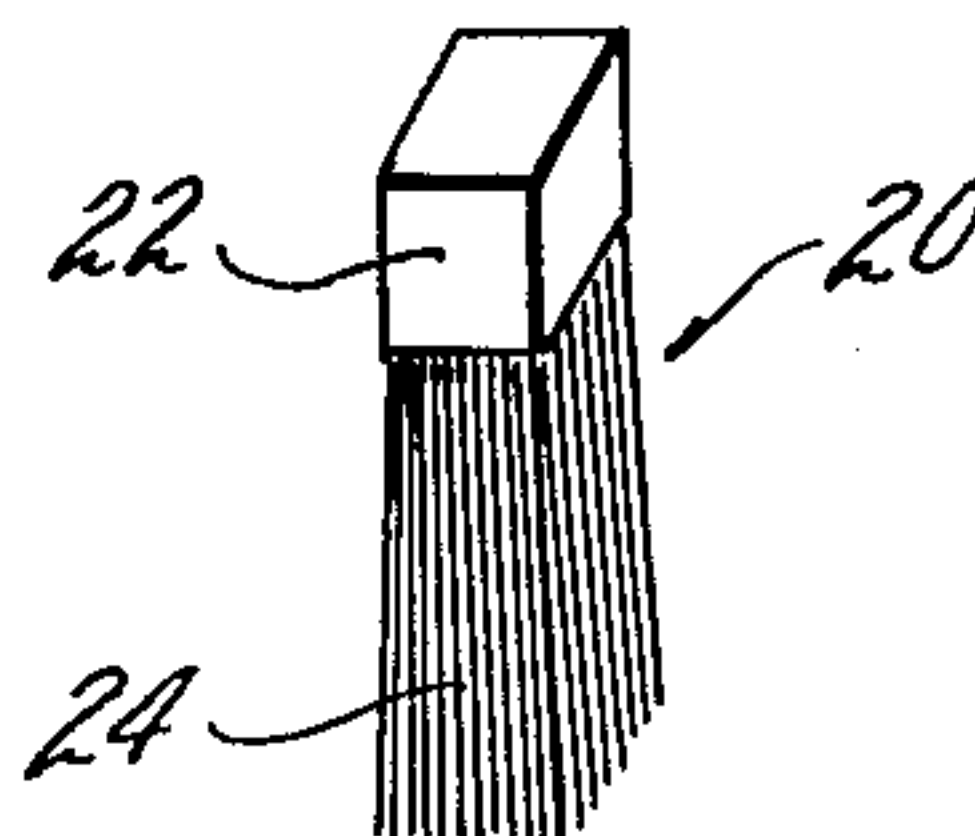


Fig. 2.

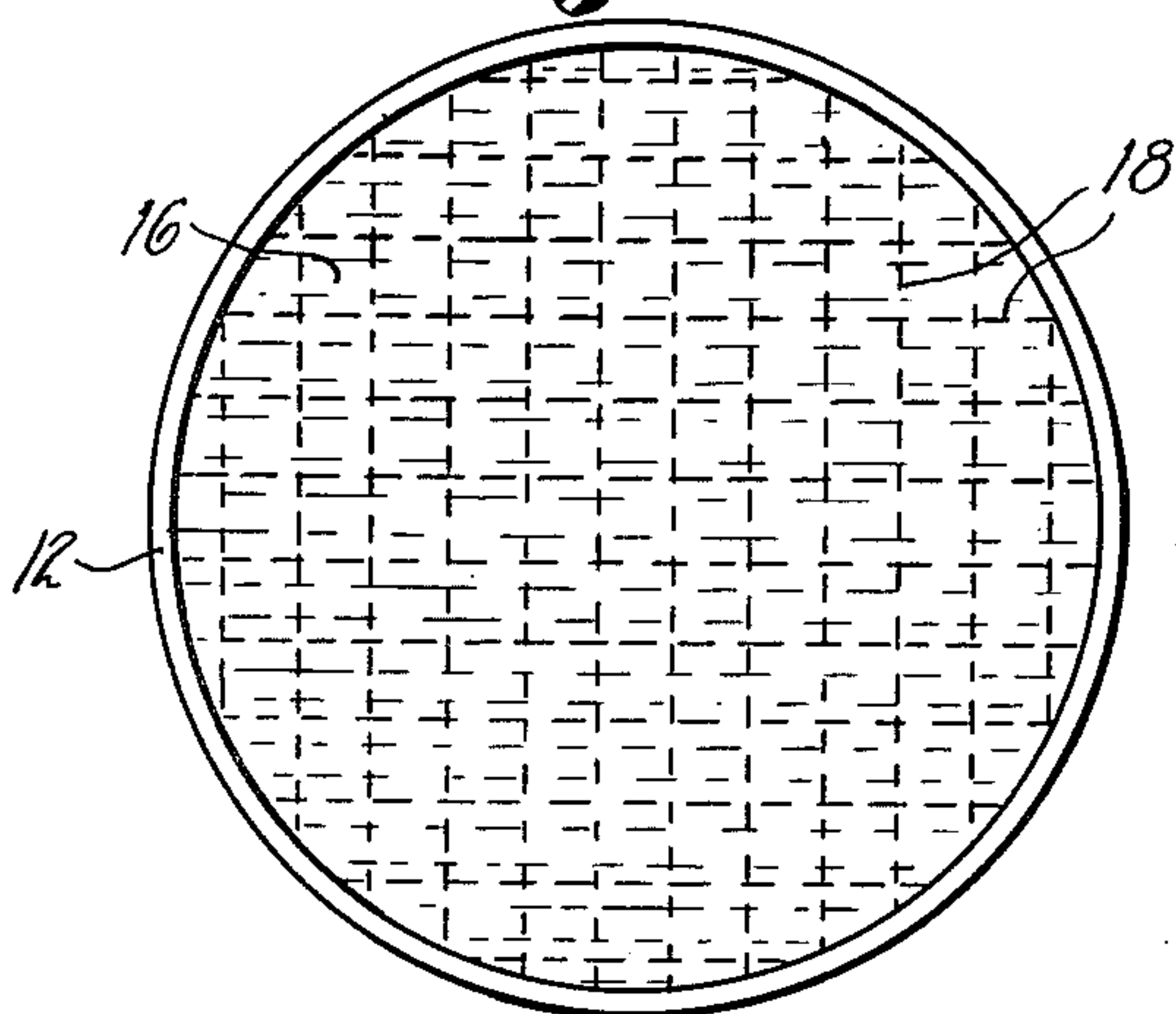


Fig. 7.

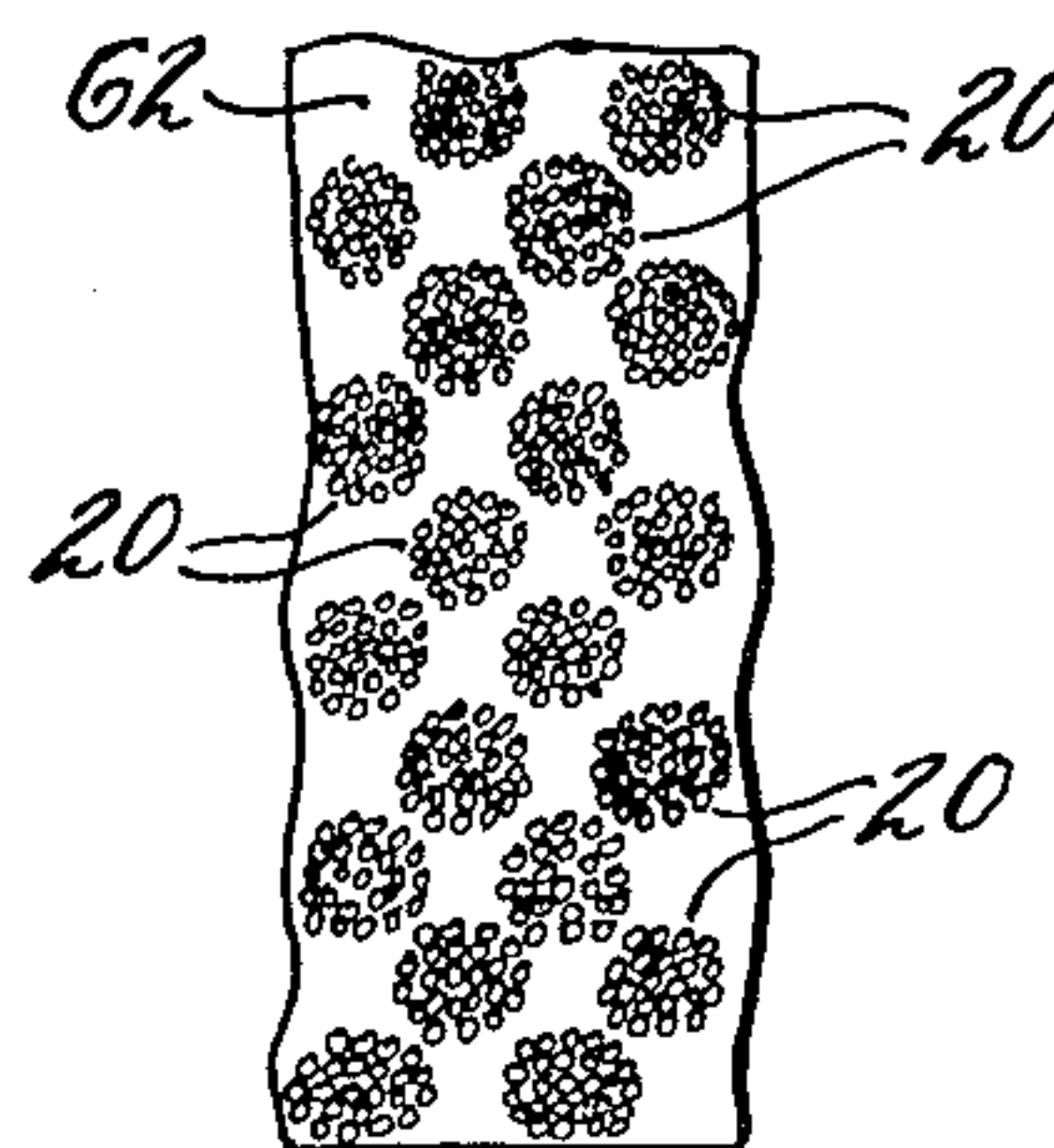


Fig. 6.

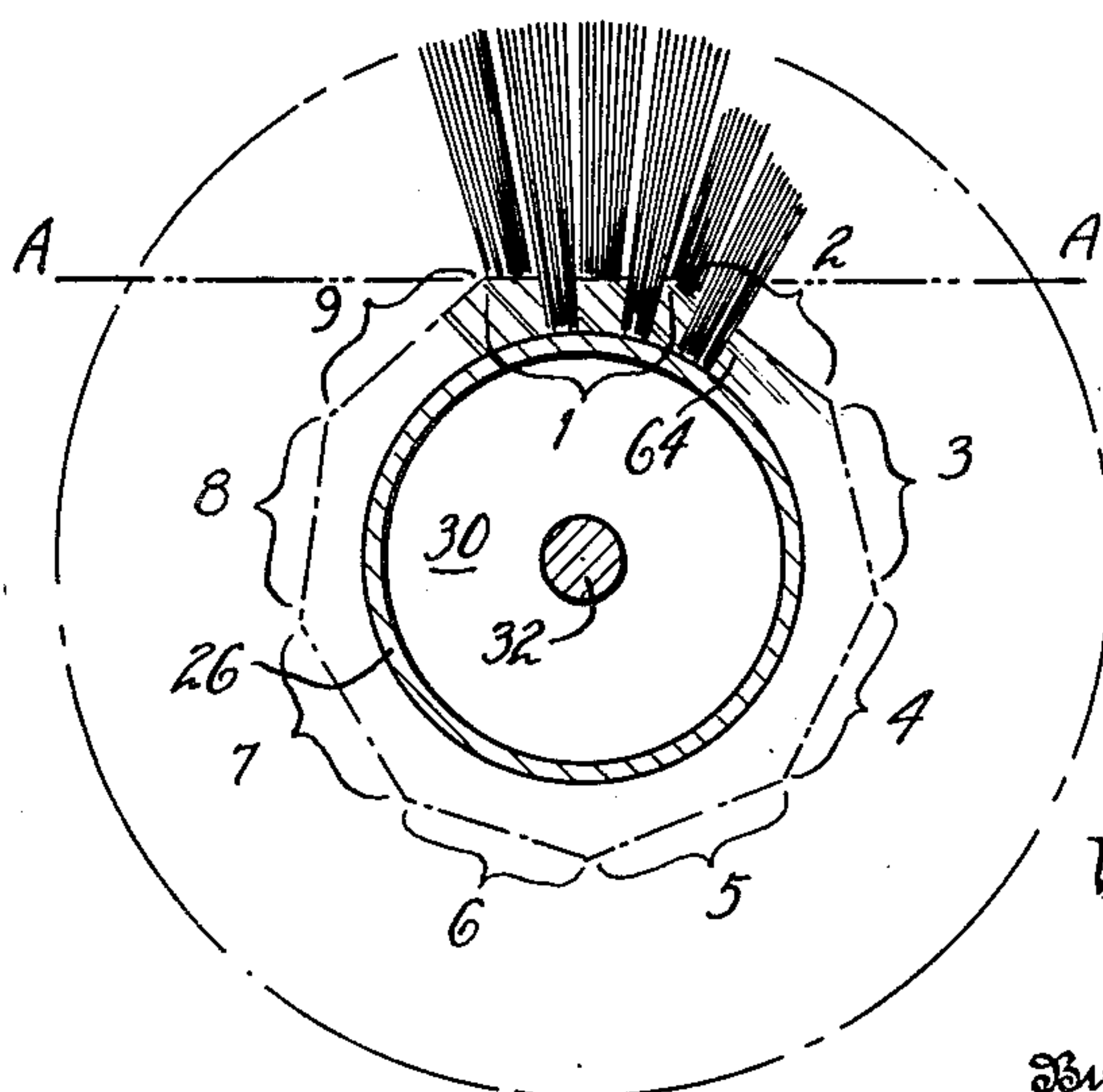
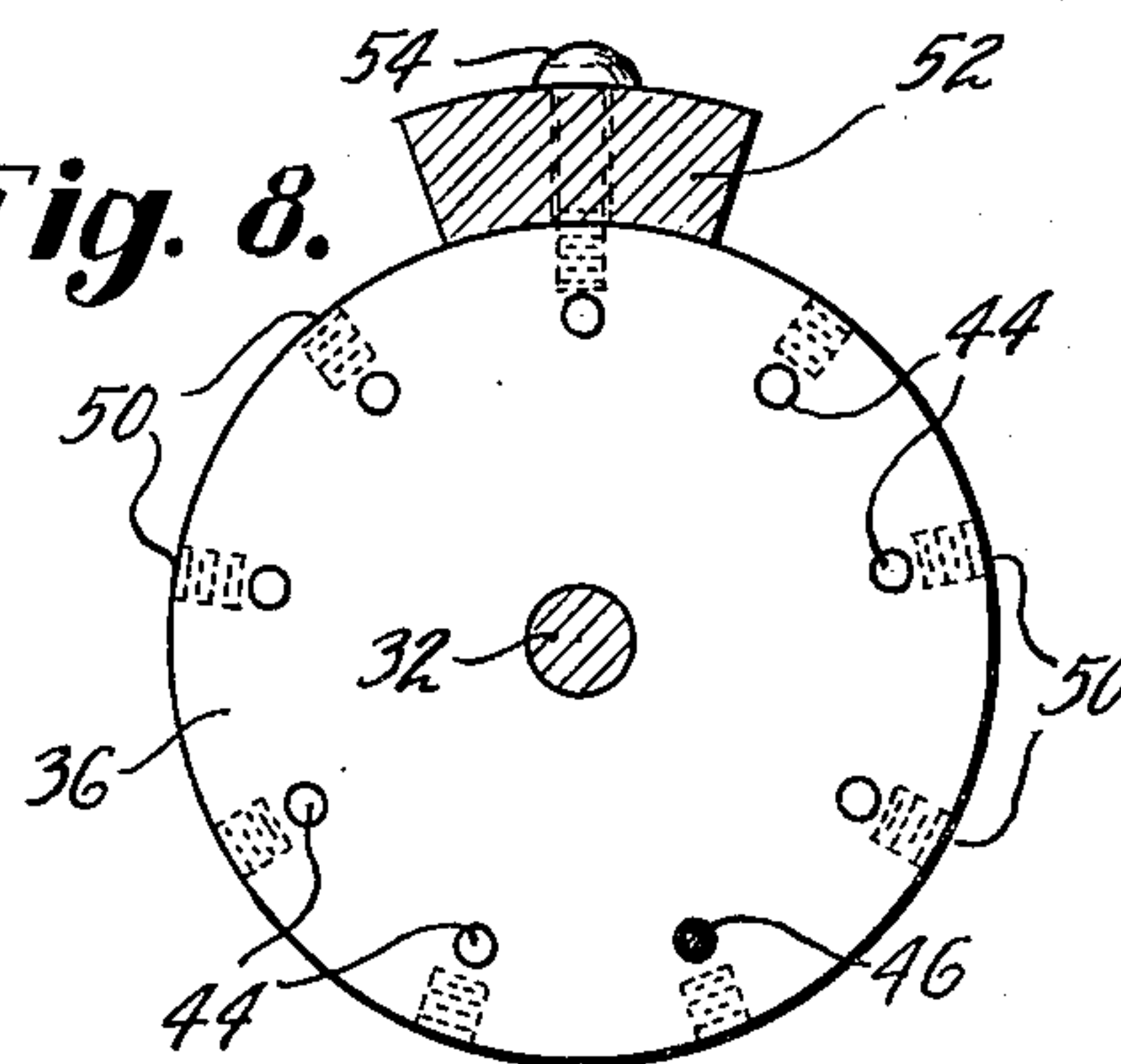


Fig. 8.



Inventor
William F. Enchelmaier

By

Alfred W. Vibber

His Attorney

Nov. 17, 1953

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2 Sheets-Sheet 2

Fig. 4.

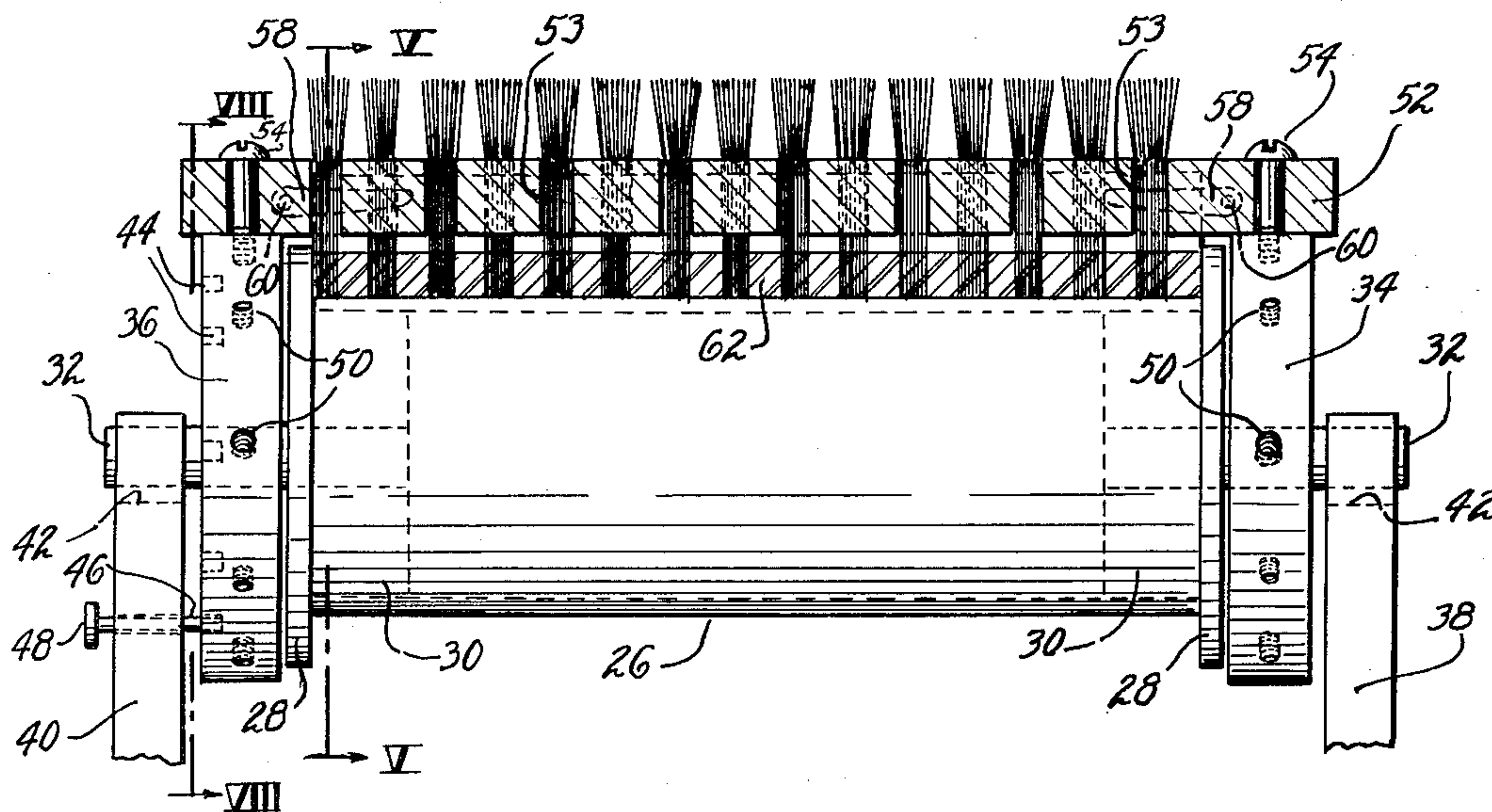
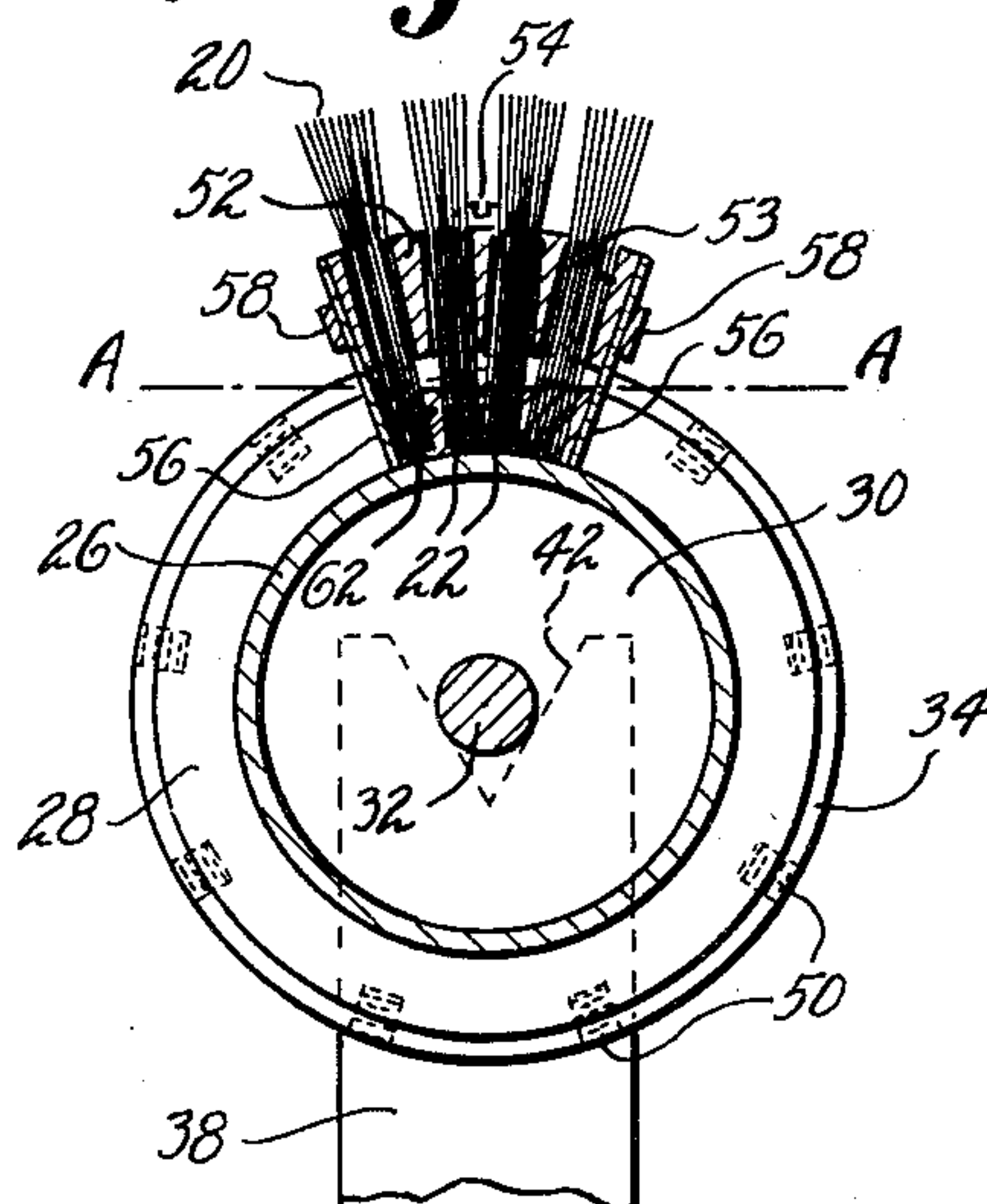


Fig. 5.



Inventor
William F. Enchelmaier

By

Alfred W. Vibber

His Attorney

UNITED STATES PATENT OFFICE

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METHOD OF MAKING BRUSHES

William F. Enchelmaier, Cedar Grove, N. J.

Application February 9, 1948, Serial No. 7,243

11 Claims. (Cl. 300—21)

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This invention relates to an improved method of making a brush. More particularly, in its preferred embodiment the invention relates to an improved method of making a brush of the rotary type which is provided with a core on which the bristles are mounted.

The invention has among its objects the provision of an improved, simplified method for making brushes of the cored type. The method of the invention is simple and economical to carry out, and results in a strong, durable, long wearing brush.

A further object of the invention resides in the provision of an improved method of making a brush of the cored rotary type, wherein the bristles are firmly bonded to the core and are accurately placed in predetermined locations thereon.

These and further objects of the invention will be more readily apparent in the following description of a preferred embodiment of the method of making brushes in accordance with the invention, of the apparatus employed in carrying out a part of the method, and of the brush resulting therefrom.

In the drawings appended hereto which form a part of the specification:

Fig. 1 is a view in side elevation, with a part thereof broken away, of apparatus employed in a preliminary step in the manufacture of brushes in accordance with the invention;

Fig. 2 is a view in plan of such apparatus with bristles having the first bonding medium applied thereto located therein;

Fig. 3 is a view in perspective of a headed tuft of bristles resulting from such preliminary step employing the apparatus of Figs. 1 and 2;

Fig. 4 is a view partially in side elevation and partially in longitudinal vertical section through a partially assembled rotary brush and the assembling jig in which it is mounted during the placing of the headed tufts on the brush core, the partial section being taken along a substantial vertical, radial plane in Fig. 5;

Fig. 5 is a view in transverse vertical section through the partially assembled brush and the assembling jig shown in Fig. 4, the section being taken along the line V—V in Fig. 4;

Fig. 6 is a transverse vertical section through the finished brush;

Fig. 7 is a fragmentary view in plan of such finished brush; and

Fig. 8 is a transverse vertical section through the assembling jig, the section being taken along the line VIII—VIII in Fig. 4.

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This application is a continuation-in-part of application Serial No. 666,666, filed May 2, 1946, now Patent 2,508,908, May 23, 1950. In the present invention the same method and apparatus are employed in the preliminary steps of forming the headed tufts or bristles as in that disclosed in the prior application, but the manner of assembly of such headed tufts on the brush core and the brush resulting from such method are different from those disclosed in the said prior application. The present invention is directed primarily to the making of cored brushes having bristles affixed thereon around all or a substantial part of their peripheries or at least at sectors or zones displaced from each other at substantial angles around their peripheries, and to rotary brushes of such type and represents an improvement over the method of the prior invention by which brushes of this type were formed.

As above stated, in the present method it is preferred to employ, as components of the brush, headed tufts of bristles made in the same manner as that disclosed in the previous application. As shown in Fig. 1, a cluster of substantially equal length bristles 10 is assembled so that the upper ends of the bristles all lie in a common plane. The cluster is tightly engaged by a band 12 whose upper margin extends above the ends of the bristles and thereby forms with such upper ends of the bristles a sink or well 14. After the cluster of bristles has been assembled within the band 12, as shown, there is deposited into the well 14 a liquid plastic bonding material such as a natural rubber cement, or a synthetic rubber cement, such cement being of sufficiently low viscosity to seep down between the bristles at their upper ends, to the depth shown, to form a bonding layer 16.

Among the synthetic rubber cements which may be employed for the bonding material 16 are the following commercially available materials in a suitable volatile vehicle: "Buna S", which is copolymerized butadiene and styrene, "Perbunan" (formerly "Buna N"), which is copolymerized butadiene and acrylonitrile, "Neoprene" (formerly "Duprene"), which is polymerized chloroprene made by polymerization of chloroprene in emulsion, and "Butyl," which is a copolymer of a butene and a diolefin. It is to be understood that such list is not exhaustive, and that various other synthetic plastic bonding materials may be employed as the first bonding medium, for heading the tufts, depending upon the use to which the brush is to be put.

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Thereafter the assembly is cured, preferably only partially, to such an extent that it is self-sustaining and of sufficient strength to hold the bristles in the tufts together during the subsequent manipulative steps. Such curing is carried out in the well known manner of subjecting the bonding material to an elevated temperature for a predetermined length of time.

After such curing step, the assembly is cut along the cross lines 18, in a direction into the paper of Fig. 2, so as to form a plurality of separate headed tufts 20, as shown in Fig. 3, in which 22 designates the portion of the bonding layer 16 associated with such tuft, and 24 the bristles of the tuft.

The rotary brush, the making of which is hereinafter described, is to include as an integral part thereof a preformed core. In the embodiment shown, such core is in the form of a right circular cylindrical tube 26 made of metal, in this instance aluminum for the sake of lightness. Such core, which has a length equal to the length of the working surface of the brush desired, is provided at each of its ends during the step of assembling the tufts and applying the additional, second, bonding material to the core, with a retainer disc 28. Such disc may, if desired, form a part of the finished brush. Disc 28 is provided with a cylindrical boss, concentric therewith, which fits within and snugly or tightly engages the inner wall of the core 26 at each end thereof. Each disc 28 and its boss 30 is provided with a central bore within which is snugly or tightly fitted a stub shaft 32. Such shaft likewise may, if desired, be a part of the finished brush.

Mounted on each stub shaft 32, as shown in Fig. 4, is an indexing disc, that at the right in Fig. 4 being designated 34, and that at the left 36. Each such indexing disc is tightly but removably mounted on its stub shaft so that no relative rotary movement takes place between the shaft and disc during the assembly of the brush. During such assembly, the partially completed brush and the assembling jig is supported on the upright supports 38 and 40, each of which carries at its upper end a V groove 42 within which the corresponding stub shaft rests.

Indexing disc 36 is provided with a plurality, in this case nine, of holes 44 extending partially therethrough from the lefthand face of the disc in Fig. 4, such holes being parallel to the axis of core 26, lying on a circle coaxial with such core, and spaced at equal angles thereabout. Support 40 is provided with a plunger 46 extending through a bore therein in such position that its inner end may be thrust into one of the holes 44 when such hole is opposite it. Knob 48 on the outer end of the plunger allows it easily to be thrust into the hole or withdrawn therefrom. As a consequence of such structure, the core 26 may selectively be indexed to any one of nine equally spaced angular positions about its axis.

Discs 34 and 36 are further provided with a plurality of threaded spaced radial holes 50 located in the same axial planes as the indexing holes 44. An elongated template or tuft locating plate 52 having tuft locating holes 53 therein is secured to discs 34 and 36 by means of the studs 54 extending through holes in the template into the holes 50 in the discs. The template is designed to be removed from one portion of the discs and to be replaced at another merely by the removal of studs 54 and then replacing them with a template at the desired different location.

As shown in Fig. 4, template 52 is of such length

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as completely to span the distance between discs 34 and 36. The template is provided on each side edge thereof with means for positioning thereon, in a radial plane, a retainer strip 56 of such length as snugly to fit between the inner surfaces of the retaining discs 28. The retainer strips are held on the template, when the former are necessary, by means of the spring clips 58 pivotally mounted on studs 60 threaded into the template, such studs permitting the spring clips to be swung into the position shown in Fig. 4, in which they hold strips 56 in place, or to be swung outwardly when such strip is to be removed or is not necessary in the brush making operation being carried out.

In carrying out the preferred embodiment of the improved method of the invention, the core 26 is positioned as shown with one zone thereof, designated 1 in Fig. 6, positioned upwardly, template 52 with each of the radially directed holes 53 therein containing a headed tuft 20 with the head 22 thereof positioned inwardly is then applied to the jig, and the headed tufts held thereby are thrust further inwardly, if necessary, toward the core 26 so that they contact it. In this step the retaining strips 56 are mounted in place on the template. Thereupon a further liquid plastic of the hardenable type is poured into the mold space provided between the core 26, the retainer strips 56, and the retaining discs 28, to a level designated by the line A—A. Such further bonding material, shown at 62 in Figs. 4 and 5, is preferably of the heat hardenable type, such as mixes of natural rubber which when fully cured are hard, strong, and substantially rigid, or of such mixes of the various synthetic rubbers, of which those given above in connection with the first bonding material are typical. It is to be understood, however, that other bonding materials may be used for medium 62, such as the thermosetting plastics of which phenol-formaldehyde, phenol-furfural and urea formaldehyde are typical.

After completion of the pouring of material 62 at one zone, such bonding material 62, with the apparatus in the position shown in Figs. 4 and 5, is partially cured to such state that the tufts 20 will remain accurately positioned during further indexing of the core. Such partial curing step is conveniently carried out by placing the whole assembly, including supports 38 and 40 and the base (not shown) to which they are attached, in an oven. After such partial curing, template 52 is removed, the core is indexed to another position, and the template applied to the indexing discs so that it again lies at the top of the assembly. The same steps of locating the headed tufts, pouring the bonding material 62 within the mold, and partially curing it, previously described, are again carried out. It is highly desirable, although not absolutely necessary, that the indexing of the core 26 be carried out so that the portion of material 62 poured at any one step shall be subjected to not more than two intermediate curing cycles before it has an adjacent portion 62 of such material poured against it. This insures the bonding together of such successive portions of the medium 62 so that when the finally assembled brush is subjected to the final curing operation for completing the curing of material 62 so that it becomes the hard, strong, cured plastic shown at 64 there are no zones of weakness between the individual sections and no appreciable differences in their properties.

Although various manners of indexing are pos-

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sible, such preferred method may be carried out, for instance, by pouring material 62 at the various zones in the following order, there being, of course, an intermediate curing step between each pour: 1, 2, 9, 3, 8, 4, 7, 5, 6. When a succeeding portion of bonding medium 62 is poured against a previously poured and partially cured portion, the retaining strip 56 is removed from the template on the side adjacent the side of the previously poured portion. When the final portion is poured, neither of the two retaining strips 56 is employed in the mold.

After the second bonding material 62 has been poured at each of sectors or zones 1-9, inclusive, and the surface of the brush core has been completely covered, the brush is subjected to a final curing cycle. The first part of such cycle is carried out with the last poured zone at the top of the brush, preferably by allowing the brush to remain in the jig in its last indexed position. After the last poured zone has been cured sufficiently for it to become self-sustaining, however, the brush may be removed from the jig and the curing completed with the brush alone in the oven.

Although in the preferred method the tufts of bristles are first applied to the core at one longitudinal zone thereof and the bonding material 62 is then applied to the core at such zone, it is to be understood that the order of such steps may be reversed. Thus in some cases it may be desirable first to deposit material 62 on the core in the mold provided by parts 28, the template 52 being in place on the jig but containing no bristles, and then to apply the headed tufts of bristles to the core by inserting them through holes 53 in the template into contact with the core as shown.

As a result of such method of making the brush, there is produced a brush in which the bristles are accurately located, very strongly bonded to each other, and also to the core. Such method is simple, positive, and economical to practice.

It is to be understood that although for the purpose of illustration I have described and shown preferred embodiments of the method of making a rotary cored brush of the type described, of the apparatus of the invention, and of the improved brush resulting from use of such method and apparatus, the method, apparatus and the resulting brush may be varied considerably as to details within the scope of my invention.

Thus, in the case of a rotary brush the core of the brush to be made by practice of the present invention, may be in the shape of a body of revolution the generatrix of which, if the core is of appreciable length, is a generally straight line. Furthermore, the core need not be in the shape of a right circular cylinder or a circular cylinder, but can be in the shape of a cylinder generally. It is, of course, preferred that when a cylindrical core is employed for a rotary brush it shall be generally convex throughout its transverse section and shall be symmetrical about its longitudinal axis. The particular shape of core employed in a rotary brush naturally depends upon the type of brush to be made and the use to which it is to be put.

When the brush is not to be rotated during use, as with brushes reciprocated along their axes, or is to be rotated only slowly, the dynamic balance of the brush is not important. Thus a

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brush of such latter type, having bristles thereon around a substantial part of its periphery, may advantageously be made by the use of the present invention with a core having generally straight longitudinal elements, if it is of appreciable length, and with a transverse section such that separate longitudinal zones of the core may have bristles and bonding material applied sequentially thereto.

I claim as new the following:

1. The method of making a cored brush in which the bristles are affixed to the core at at least two sectors displaced from each other at a substantial angle around the periphery of the brush, which comprises positioning bristles on the core in one sector thereof, depositing curable bonding material on the core in such sector, the bonding material contacting the portion of the bristles adjacent the core, partially curing the thus deposited bonding material so that it becomes self-sustaining and holds the bristles in that sector in position during the subsequent brush-forming operations, repeating such steps of positioning the bristles, depositing curable bonding material on the core, the bonding material contacting the portion of the bristles adjacent the core, and partially curing the deposited bonding material at another sector displaced at a substantial angle around the periphery of the brush from the first sector, and then completing the curing of the bonding material in all sectors of the brush thus formed.

2. The method of making a cored brush in which the bristles are affixed to the core at at least two sectors displaced from each other at a substantial angle around the periphery of the brush which comprises placing the core with its axis generally horizontal, positioning bristles on the core in one sector at the top thereof, depositing curable bonding material on the core in such sector, the bonding material contacting the portion of the bristles adjacent the core, partially curing the thus deposited bonding material while the brush and such sector remain generally horizontal and at the top of the brush, respectively, so that it becomes self-sustaining and holds the bristles in that sector in position during the subsequent brush-forming operations, then turning the core about its axis to bring another sector thereof to the top of the core, repeating such steps of positioning the bristles, depositing curable bonding material on the core, the bonding material contacting the portion of the bristles adjacent the core, and partially curing such deposited bonding material at such other sector while such other sector remains generally in the same position, and then completing the curing of the bonding material in all sectors of the brush thus formed.

3. The method of making an elongated cored brush in which the bristles are affixed to the core at at least two sectors longitudinally of the core displaced from each other at a substantial angle around the periphery of the brush which comprises placing the core with its top element generally horizontal, positioning bristles on the core in one sector at the top thereof, depositing curable bonding material on the core in such sector, the bonding material contacting the portion of the bristles adjacent the core, partially curing the thus deposited bonding material while such sector of the brush remains at the top of the core and generally horizontal so that it becomes self-sustaining and holds the bristles in that sector in position during the subsequent

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brush-forming operations, then turning the core about its axis to bring another sector thereof to the top of the core in generally horizontal position, repeating such steps of positioning the bristles, depositing curable bonding material on the core, the bonding material contacting the portion of the bristles adjacent the core, and partially curing such deposited bonding material at such other sector while such other sector remains generally in the same position, and then completing the curing of the bonding material in all sectors of the brush thus formed.

4. The method of making an elongated cored brush the longitudinal elements of the core of which are substantially straight lines and in which the bristles are affixed to the core at at least two sectors longitudinally of the core displaced from each other at a substantial angle around the periphery of the brush which comprises placing the core with its top element generally horizontal, positioning bristles on the core in one sector at the top thereof, depositing curable bonding material on the core in such sector, the bonding material contacting the portion of the bristles adjacent the core, partially curing the thus deposited bonding material while such sector of the brush remains at the top of the core and generally horizontal so that it becomes self-sustaining and holds the bristles in that sector in position during the subsequent brush-forming operations, then turning the core about its axis to bring another sector thereof to the top of the core in generally horizontal position, repeating such steps of positioning the bristles, depositing curable bonding material on the core, the bonding material contacting the portion of the bristles adjacent the core, and partially curing such deposited bonding material at such other sector while such other sector remains generally in the same position, and then completing the curing of the bonding material in all sectors of the brush thus formed.

5. The method of making an elongated cored brush the longitudinal elements of the core of which are substantially straight lines in which the bristles are affixed to the core at at least two sectors longitudinally of the core displaced from each other at a substantial angle around the periphery of the brush which comprises placing the core with its top element generally horizontal, positioning bristles on the core in one sector at the top thereof, depositing a thermo-setting bonding material on the core in such sector, the bonding material contacting the portion of the bristles adjacent the core, partially curing the thus deposited bonding material by subjecting it to heat while such sector of the brush remains at the top of the core and generally horizontal so that it becomes self-sustaining and holds the bristles in position during the subsequent brush-forming operations, then turning the core about its axis to bring another sector thereof to the top of the core in generally horizontal position, repeating such steps of positioning the bristles, depositing a thermo-setting bonding material on the core, the bonding material contacting the portion of the bristles adjacent the core, and partially curing such deposited bonding material at such other sector by subjecting it to heat while such other sector remains generally in the same position, and then completing the curing of the bonding material in all sectors of the brush thus formed by subjecting it to heat.

6. The method of making an elongated cored

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brush the longitudinal elements of the core of which are substantially straight lines and in which the bristles are affixed to the core at at least two sectors longitudinally of the core displaced from each other at a substantial angle around the periphery of the brush which comprises placing the core with its top element generally horizontal, positioning bristles on the core in one sector at the top thereof, depositing liquid thermo-setting bonding material on the core in such sector, the bonding material permeating the portion of the bristles, adjacent the core, partially curing the thus deposited bonding material by subjecting it to heat while such sector of the brush remains at the top of the core and generally horizontal so that it becomes self-sustaining and holds the bristles in position during the subsequent brush-forming operations, then turning the core about its axis to bring another sector thereof to the top of the core in generally horizontal position, repeating such steps of positioning the bristles, depositing liquid thermo-setting bonding material on the core, the bonding material permeating the portion of the bristles adjacent the core, and partially curing such deposited bonding material at such other sector while such other sector remains generally in the same position, and then completing the curing of the bonding material in all sectors of the brush thus formed by subjecting it to heat.

7. The method of making an elongated cored brush the longitudinal elements of the core of which are substantially straight lines and in which the bristles are affixed to the core at a plurality of similar sectors longitudinally of the core displaced from each other at a substantial angle around the periphery of the brush, at least some of the sectors being immediately adjacent and contacting others of the sectors, which comprises placing the core with its top element generally horizontal, positioning bristles on the core in a first sector at the top thereof, depositing liquid thermo-setting bonding material on the core in such first sector, the bonding material permeating the portion of the bristles adjacent the core, partially curing the thus deposited bonding material while such first sector of the brush remains at the top of the core and generally horizontal so that it becomes self-sustaining and holds the bristles in position during the subsequent brush-forming operations, then successively indexing the core to bring each sector of the core to which bristles are to be applied to a generally horizontal position at the top of the core, and between indexing steps repeating at each top sector the steps of positioning the bristles, depositing liquid thermo-setting bonding material on the core, the bonding material permeating the portion of the bristles adjacent the core, and partially curing such deposited bonding material at the then top sector while such top sector remains generally in the same position, the manner of indexing the core being such that liquid thermo-setting bonding material in one sector is deposited in contact with the bonding material of an immediately adjacent sector which has been subjected in all instances to not more than two partial curing treatments, and then completing the curing of the bonding material in all sectors of the brush thus formed by subjecting it to heat.

8. The method of making a cored brush in which the bristles are affixed to the core at at least two sectors displaced from each other at a

substantial angle around the periphery of the brush, which comprises the following steps in the order named: positioning bristles on the core in one sector thereof, depositing curable bonding material on the core in such sector, the bonding material contacting the portion of the bristles adjacent the core, partially curing the thus deposited bonding material so that it becomes self-sustaining and holds the bristles in that sector in position during the subsequent brush-forming operations, repeating such steps of positioning the bristles, depositing curable bonding material on the core, the bonding material contacting the portion of the bristles adjacent the core, and partially curing such deposited bonding material at another sector displaced at a substantial angle around the periphery of the brush from the first sector, and then completing the curing of the bonding material in all sectors of the brush thus formed.

9. The method of making an elongated cored brush in which the bristles are affixed to the core at at least two sectors longitudinally of the core displaced from each other at a substantial angle around the periphery of the brush which comprises the following steps in the order named: placing the core with its top element generally horizontal, positioning bristles on the core in one sector at the top thereof, depositing curable bonding material on the core in such sector, the bonding material contacting the portion of the bristles adjacent the core, partially curing the thus deposited bonding material while such sector of the brush remains at the top of the core and generally horizontal so that it becomes self-sustaining and holds the bristles in that sector in position during the subsequent brush-forming operations, then turning the core about its axis to bring another sector thereof to the top of the core in generally horizontal position, repeating such steps of positioning the bristles, depositing curable bonding material on the core, the bonding material contacting the portion of the bristles adjacent the core, and partially curing such deposited bonding material at such other sector while such other sector remains generally in the same position, and then completing the curing of the bonding material in all sectors of the brush thus formed.

10. The method of making an elongated cored brush the longitudinal elements of the core of which are substantially straight lines in which the bristles are affixed to the core at at least two sectors longitudinally of the core displaced from each other at a substantial angle around the periphery of the brush which comprises the following steps in the order named: placing the core with its top element generally horizontal, positioning bristles on the core in one sector at the top thereof, depositing a thermo-setting bonding material on the core in such sector, the bonding material permeating the portion of the bristles adjacent the core, partially curing the thus deposited bonding material by subjecting it to heat while such sector of the brush remains at the top of the core and generally horizontal so that it becomes self-sustaining and holds the

bristles in position during the subsequent brush-forming operations, then turning the core about its axis to bring another sector thereof to the top of the core in generally horizontal position, repeating such steps of positioning the bristles, depositing a thermo-setting bonding material on the core, the bonding material permeating the portion of the bristles adjacent the core, and partially curing such deposited bonding material at such other sector by subjecting it to heat while such other sector remains generally in the same position, and then completing the curing of the bonding material in all sectors of the brush thus formed by subjecting it to heat.

11. The method of making an elongated cored brush the longitudinal elements of the core of which are substantially straight lines and in which the bristles are affixed to the core at a plurality of similar sectors longitudinally of the core displaced from each other at a substantial angle around the periphery of the brush, at least some of the sectors being immediately adjacent and contacting others of the sectors, which comprises the following steps in the order named: placing the core with its top element generally horizontal, positioning bristles on the core in a first sector at the top thereof, depositing liquid thermo-setting bonding material on the core in such first sector, the bonding material permeating the portion of the bristles adjacent the core, partially curing the thus deposited bonding material while such first sector of the brush remains at the top of the core and is generally horizontal so that it becomes self-sustaining and holds the bristles in position during the subsequent brush-forming operations, then successively indexing the core to bring each sector of the core to which bristles are to be applied to a generally horizontal position at the top of the core, and between indexing steps repeating at each top sector the steps of positioning the bristles, depositing liquid thermo-setting bonding material on the core, the bonding material permeating the portion of the bristles adjacent the core, and partially curing such deposited bonding material at the ten top sectors while such top sector remains generally in the same position, the manner of indexing the core being such that liquid thermo-setting bonding material in one sector is deposited in contact with the bonding material of an immediately adjacent sector which has been subjected in all instances to not more than two partial curing treatments, and then completing the curing of the bonding material in all sectors of the brush thus formed by subjecting it to heat.

WILLIAM F. ENCHELMAIER.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
654,184	Schwartz	July 24, 1900
826,119	Schwartz	July 17, 1903
1,280,944	Barry	Oct. 8, 1918
1,721,062	Angell	July 16, 1929
1,996,544	Justice	Apr. 2, 1935
2,261,781	Smellie	Nov. 4, 1941