June 25, 1963 T. MARKS 3,095,240

MACHINES FOR TRIMMING TWISTED WIRE BRUSHES

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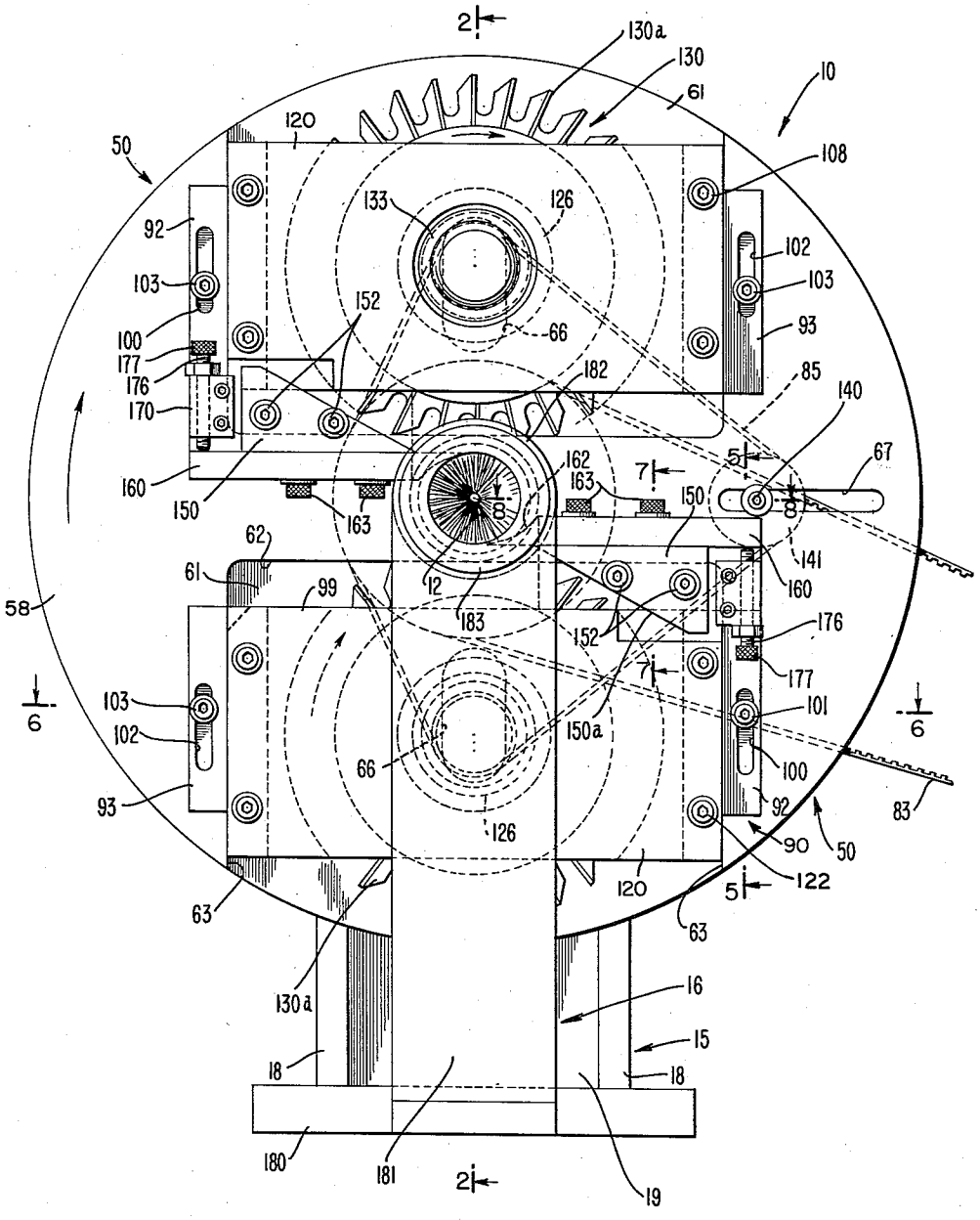



Fig. 1

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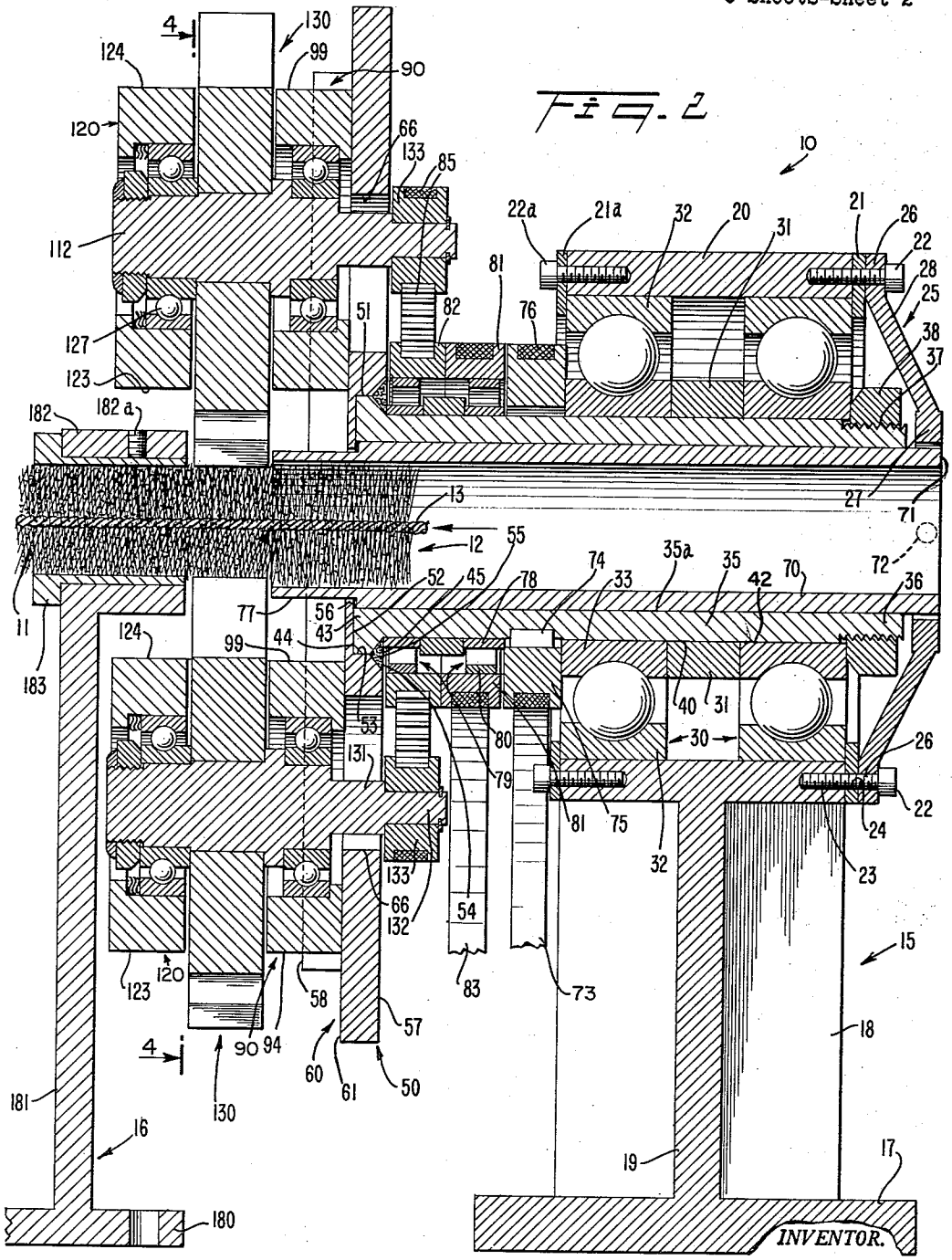
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MACHINES FOR TRIMMING TWISTED WIRE BRUSHES

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Fig. 2




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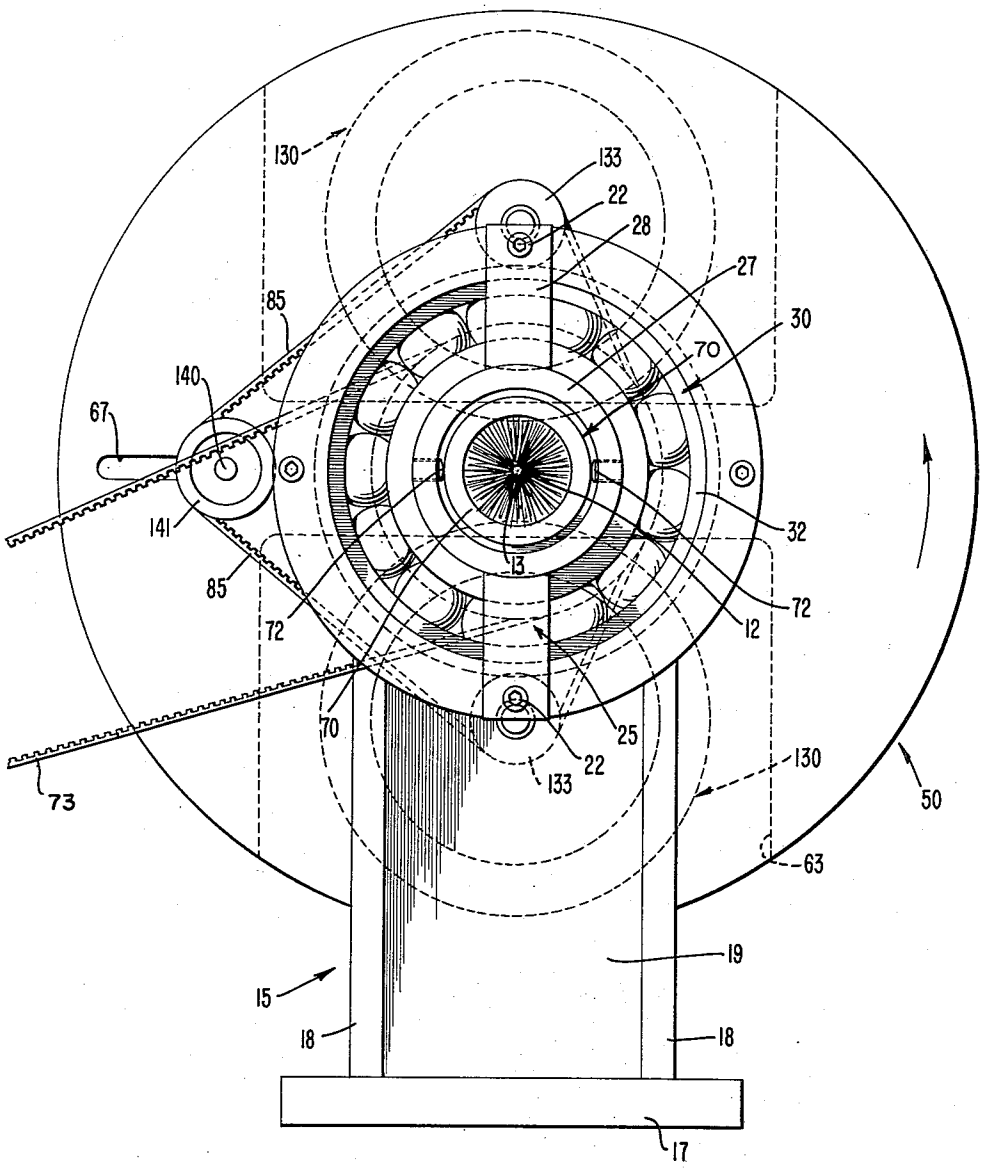



Fig. 3

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Fig. 4

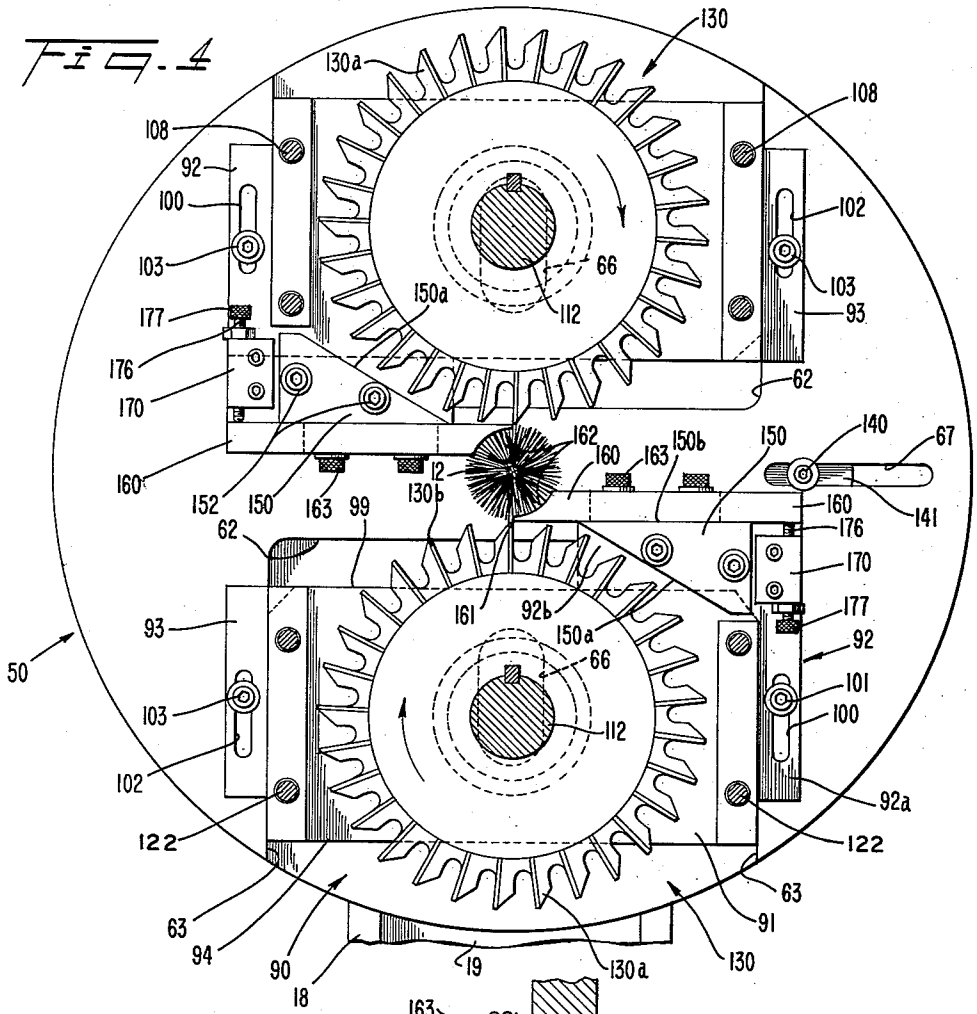
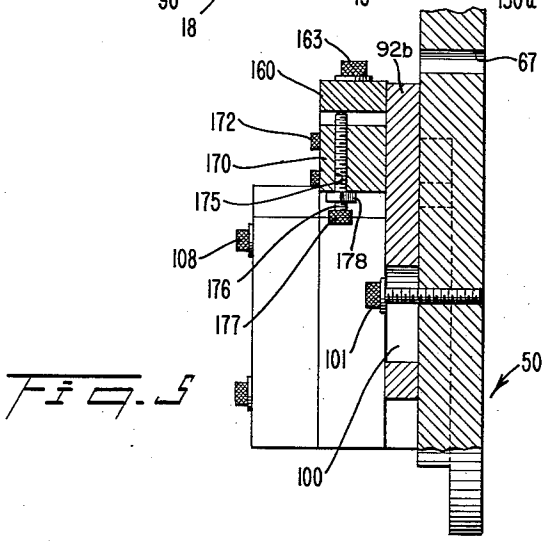



Fig. 5




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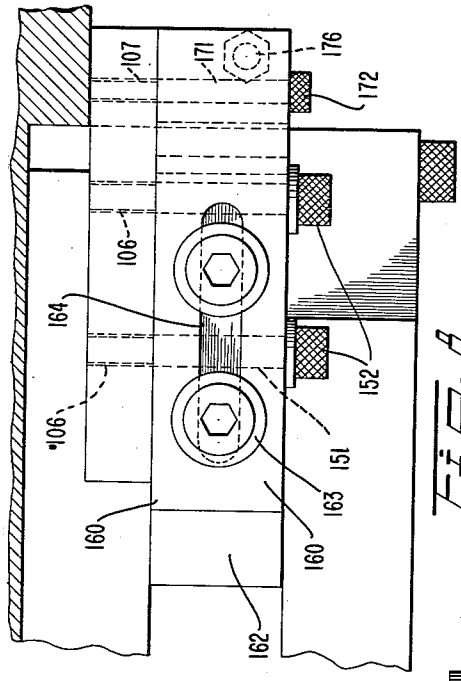
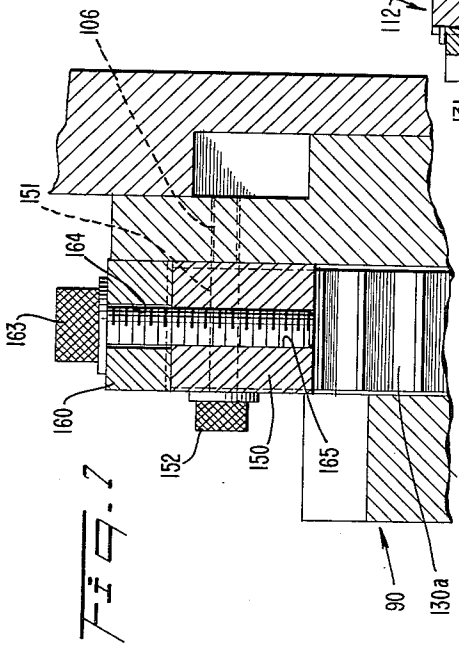



FIG. 7



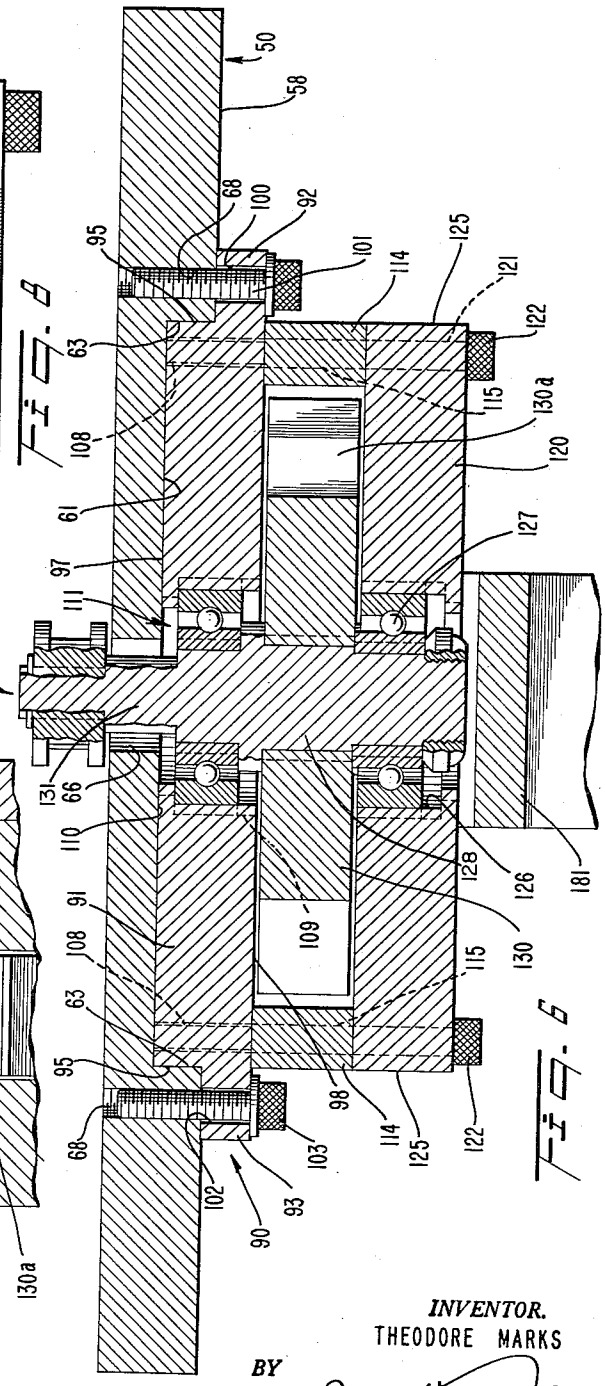




FIG. 8

FIG. 6

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United States Patent Office 3,095,240 Patented June 25, 1963



# 3,095,240
# MACHINES FOR TRIMMING TWISTED WIRE BRUSHES

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21 Claims. (Cl. 300—17)

This invention relates to machines for trimming twisted wire brushes having radial bristles.

Heretofore, machines for trimming twisted wire brushes comprised full length rotary cutters which operated like grasscutters, having longitudinal helical cutting blades. The difficulty with such machines has been found to be that the wire brushes being supported only at its ends, during the trimming operation sagged at the middle, so that they were not trimmed to cylindrical outer shape. The length of brushes so trimmed was thus curtailed.

It is hence an object of this invention to provide a machine of the character described which obviates the aforementioned difficulty, said machine having means to feed the brush axially past rather narrow cutters, so that the brush can be supported at closely spaced longitudinal points, whereby to prevent sagging of the brush, and ensuring a good and neat cylindrical trim for the brush.

Another object of this invention is to provide a brush trimming machine of the character described utilizing a shearing cut, wherein the bristles are cut between rotary milling type cutters and shearing blades tangent thereto.

Still another object of this invention is to provide a machine of the character described which may accommodate brushes of various cylindrical sizes and of any length desired, and wherein the parts are adjustable and replaceable to trim the brushes to desired size, and in which accuracy of size of trim may be obtained.

Yet another object of this invention is to provide a strong and durable machine of the character described which shall be relatively inexpensive to manufacture and operate, which shall be easy to assemble and adjust and which shall yet be smooth and positive in operation, and practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter described and of which the scope of invention will be indicated in the following claims.

In the accompanying drawings in which is shown an illustrative embodiment of this invention,

FIG. 1 is an elevational view at the outlet or rear end of the machine;

FIG. 2 is a cross-sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is an elevational view of the inlet or front end of the machine;

FIG. 4 is a cross-sectional view taken on line 4—4 of FIG. 2;

FIG. 5 is a cross-sectional view taken on line 5—5 of FIG. 1;

FIG. 6 is a cross-sectional view taken on line 6—6 of FIG. 1;

FIG. 7 is a cross-sectional view taken on line 7—7 of FIG. 1; and

FIG. 8 is a cross-sectional view taken on line 8—8 of FIG. 1.

Referring now in detail to the drawing, 10 (FIGS. 1, 2) designates a machine embodying the invention for trimming the bristles 11 of a length of twisted wire brush 12. In the brush 12, the bristles are clamped between



helically twisted wires 13 which forms a spine, and from which the bristles extend radially. When the brush is made, the ends of bristles 11 are uneven in length. The purpose of the present machine is to trim the ends of the bristles 11 so that said bristles are reduced to equal radial lengths so that the outer ends of the bristles lie in a cylindrical imaginary surface.

The machine 10 comprises a pair of spaced front and rear supports or stands 15 and 16, respectively. The stand 15 has a rectangular base 17. Extending up from base are parallel vertical walls 18 connected by a central transverse vertical web 19. Walls 18 and web 19 extend up to a cylindrical sleeve 20 which is as long as the walls 18 are wide. At the outer end of sleeve 20 is a ring 21 attached to said sleeve by screws 22 passing through threaded openings 23 in the sleeve and through suitable holes 24 in the ring. There are four screws 22 spaced 90° apart. Ring 21 has an inner diameter less than the inner diameter of sleeve 20.

One pair of opposed screws 22 serves to attach to the sleeve 20 and ring 21, a transverse member 25. Said member 25 has holes 26 to accommodate said pair of opposed screws 22, and comprises a central ring 27 and inclined radial portions 28, so that said ring is spaced from the adjacent end of sleeve 20.

Within sleeve 20 are a pair of similar spaced ball bearing assemblies 30 separated by a spacer 31. Each assembly 30 comprises an outer race 32 and an inner race 33. Ring 21 contacts the outer race 32 of one of the assemblies 30. Attached to the opposite end of sleeve 20 by screws 22*a* is a ring 21*a* which overlaps the other assembly 30. Thus, both ball bearing assemblies are confined within sleeve 20.

Supported within the inner races 33 of the assemblies 30 is a rotary sleeve 35 having one end 36 extending beyond sleeve 20 and externally threaded as at 37 to receive a nut 38 contacting the inner race of the adjacent assembly 30.

Sleeve 35 has an outer cylindrical surface 40 extending beyond the inner or rear side of stand 15. At its inner end, sleeve 35 has an outwardly extending annular flange 43 having an outer surface 44 and an inner beveled surface 45.

Force fitted onto flange 43 is a main annular plate or disc 50. Said disc 50 has at one side, an axial counterbored opening or recess 51 to receive flange 43 with a force fit. Said opening 51 forms a flat surface 52 contacting surface 44 of flange 43, and an annular surface 53 contacting the outer annular edge of flange 43. Extending from surface 53 is a bevelled surface 54 making a V-groove with bevel surface 45 to receive weld material 55 to weld plate 50 to sleeve 35. Plate 50 is formed with an axial through opening 56 having a diameter less than the diameter of the inner surface 35*a* of sleeve 35. Opening 56 extends to the counterbore 51 and is coaxial therewith.

Plate 50 has a front surface 57 and a rear surface 58. At its rear surface, plate 50 has a pair of diametrically opposed similar recesses 60 forming depressed surfaces 61. Each recess 60 has an inner shoulder or edge 62 (FIG. 1) from which extend parallel side shoulders or edges 63. The through opening 56 has a diameter tangent to said inner edges 62.

Said plate 50 is formed with a pair of aligned, similar, diametrical, symmetrical slots 66 (FIGS. 1 and 6) in the center of the surface 61. Said plate 50 is also formed on one side thereof, with an elongated, radial slot 67 (FIGS. 1 and 5) spaced 90° from slots 66, and parallel to edges 62 and disposed beyond a pair of aligned edges 63 of recesses 60. Said plate is also formed, at the outer sides of edges 63, with screw threaded openings 68 (FIG. 6).

Extending through sleeve **35** is an inner fixed tube or bushing **70** (FIG. 2). The front end **71** of the tube **70** is disposed within ring **27** and is spaced therefrom, but fixed thereto by set screws **72**. At its rear end, said tube **70** has a portion with an outer surface **77** of reduced diameter, passing loosely through opening **56** in plate **50**.

The brush **12** is fed or moved from right to left (front to rear) looking at FIG. 2.

Keyed to surface **40** of sleeve **35**, as at **74**, is a main plate drive pulley **75** (FIG. 2) disposed against the adjacent inner race **33**, and having a corrugated outer surface **76**; and it is driven by an appropriate belt **73** (FIGS. 2 and 3).

Fixed to surface **42** of sleeve **35** and disposed between pulley **75** and plate **50**, are the inner races **78** of roller bearings **79**, having outer races **80** to which are fixed a pair of cutter drive pulleys **81**, **82** welded or otherwise attached to each other for rotation as a unit.

Pulley **81** may have an outer corrugated surface and is driven by belt **83** (FIGS. 1, 2) engaged therewith.

Pulley **82** also has an outer corrugated surface and is driven by a belt **85** (FIGS. 2, 3) which will be described hereinafter.

Pulley **81** is driven at a somewhat greater speed than pulley **75**, for the purpose hereinafter appearing.

Mounted on plate **50** and partially received in recesses **60** are a pair of similar, symmetrical plates **90** (FIG. 6). Only one of said plates will be described. Plate **90** has a central substantially rectangular thick portion **91** and thinner wings **92**, **93** at the ends thereof. The front portion of central portion **91** fits into recess **60**, whereas the thinner wings **92**, **93** overlie surface **58** of plate **50**.

Plate **90** has an outer edge **94** parallel to edge **62** and remote therefrom, and side edges **95** contacting edges **63**, a front surface **97** contacting surface **61** and a rear surface **98** spaced from the plane of surface **58**. Said plate **90** has an inner edge **99** parallel to edge **62** and closer thereto.

Wing **92** has a portion **92*a*** extending outwardly of central portion **91**, and a portion **92*b*** (FIG. 5) extending beyond edge **62**.

Wing portion **92*a*** of wing **92** is formed with a longitudinal slot **100** (FIG. 4) parallel to edges **95**, and registering with one screw threaded opening **68**, to receive a screw **101** (FIGS. 4, 5) passing through said slot and screwed into said threaded opening.

Wing **93** has a slot **102** similar to slot **100** and parallel thereto and registering with an opposite opening **68**, so that an attaching screw **103** may be passed through said slot and screwed to said opposite screw threaded opening.

Wing portion **92*b*** is formed with a pair of horizontally and vertically spaced threaded openings **106** (FIG. 8) for the purpose hereinafter appearing. It is also formed with a pair of aligned smaller tapped openings **107** (FIG. 8). Said plate **90** is also formed, in the thicker central portion thereof, and adjacent edges **95** with pairs of through, screw threaded openings **108**.

Said plate **90** is also formed with a central bore **109** (FIG. 6), and with an inwardly extending annular flange **110** at the front end of the bore. In bore **109** is a ball bearing **111** having an outer race fixed to the plate **90** and an inner race supporting an axial through shaft **112**.

At the rear surface **98** of plate **90** are a pair of side parallel spacer bars **114** formed with smooth through openings **115** registering with the pairs of openings **108** in plate **90**. Contacting said spacer bars **114** is a plate **120** formed with smooth through openings **121** registering with openings **115**. Screw **122** passing through openings **121**, **115** are screwed into opening **108** to fix plates **120** to plates **90** in spaced overlying parallel relation thereto.

Plates **120** are rectangular in shape, having parallel edges **123** and **124** in the planes of edges **94** and **99** of plates **90**. Plates **120** furthermore have parallel edges **125** in the planes of edges **95** of plates **90**. Said plates **120** further have central bores **126** to receive bearings **127** in which shafts **112** are journalled.

Said shafts **112** have central portions **128** between plates **90**, **120** to which are keyed milling type cutters **130** having a plurality of radial blades **130*a***. Said shafts **112** have front end portions **131** passing through slots **66** and therebeyond as at **132**. Mounted on and keyed to said shaft portions **132** are cutter shaft pulleys **133** having outer corrugated surfaces engaging said belt **85**.

Extending through slot **67** is an idler pulley shaft **140** projecting beyond the front side of plate **50**; and rotatably mounted on the projecting portion thereof is an idler pulley **141**. A nut on a threaded portion of shaft **140** may serve to keep the pulley **141** on said shaft. Pulley **141** engages the inside of endless belt **85**, and may be adjusted along slot **67** to tighten the belt. Pulleys **82**, **133** and **141** are in alignment and are all engaged by the endless belt **85**.

The cutters **130** are rotated in the same direction (clockwise, looking at FIGS. 1 and 4).

The plate **50** is rotated through rotation of sleeve **35** by pulleys **75**. Rotation of pulley **82** at a greater rate of speed, causes the cutter pulleys to rotate relative to plate **50** to rotate the cutters **130** on their axes.

Means is provided jointly with the rotary cutters to cause a shearing cutting action on the bristles of the brush. To this end there is attached to each wing portion **92*b***, a triangular block **150** having smooth through openings **151** registering with openings **106** in said wing portion. Screws **152** passing through openings **151** are screwed into openings **106** to attach said block **150** to said wing portion **92*b***.

Block **150** is in the plane of cutters **130** and has an inclined underside **150*a*** (FIG. 4) so as not to interfere with the cutter. Attached to the inner surface **150*b*** of each block **150** is a cutter blade **160** tangent to the rotary cutter and having, at its inner end, a cutting edge **161**, (FIG. 4), and an inwardly curved surface **162** extending from said edge.

Each blade **160** is attached to block **150** by means of screws **163** passing through a slot **164** in the blade and screwed to openings **165** (FIG. 7) in the block.

Attached to each wing portion **92*b*** is also a block **170** having smooth openings **171** registering with openings **107** in said wing portion. Screws **172** pass through smooth openings **171** and are screwed into openings **107** to fix block **170** to said wing portion **92*b***. Each block **170** has a through screw threaded opening **175** (FIG. 5) to receive a screw **176** having a head **177** at its outer end. A lock nut **178** (FIG. 5) may be provided for each screw **176**. The inner end of screw **176** contacts an outer end of blade **160**. By loosening the screws **163**, screws **176** may be adjusted to make fine adjustments of edges **161** of blades **160**.

The outer ends of the bristles **11** extend between the cutting edges **130*b*** of the blades **130*a*** of cutters **130** and the edges **161** of blades **160**, and are sheared or trimmed off.

The stand **16** is at the receiving or outlet or rear end of the machine. The same comprises a base **180** from which extends upwardly leg **181**. At the upper end of leg **181** is a sleeve **182** (FIG. 2) coaxial with sleeve **70**. Received in sleeve **182** and fixed thereto by a set screw **182*a*** or in any other suitable manner, is fixed tube or bushing **183** having an inner diameter equal to the diameter of the trimmed brush. This bushing **183** is interchangeable with bushings of various sizes.

The inner diameter of bushing **183** is smaller than the inner diameter of guide sleeve **70** which receives the untrimmed brush.

It will now be understood that the brush is unsupported only between sleeve **70** and bushing **183**. This is a narrow space and the brush will not sag. Furthermore, brushes of any length may be passed through

the machine for trimming. The cutting or trimming is accurate and fast by means of the cutters **130** and the trimming is clean because of the shearing action.

The cutters **130** may be adjusted by means of screws **101** (FIG. 1) moving in slots **100**. During adjustment, shafts **112** may move radially in slots **66**.

Pulley **81** is driven by belt **83** at a somewhat greater speed than pulley **75** is driven by belt **73**. Pulley **75** rotates plate **50** which causes rotation of the shafts **112** about the axis of said plate. Pulley **82** being fixed to pulley **81** rotates therewith, and through belt **85**, rotates the shafts **112** and hence the rotary cutters **130** about the axes of said shafts, due to the fact that pulley **82** is rotated at a greater speed than plate **50**. The cutters **130** trim the bristles of the brush by shearing against the cutting edges **161** of cutter blades **160**.

It will thus be seen that there is provided an apparatus in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

It will be noted that the axial distance between tubes **70, 183** is no greater than the internal diameter of said tube **70**. This short distance of no support for the brush is not enough to allow sagging of the brush.

I claim:

1. In combination, a support, a tube fixed to said support through which a twisted wire brush may be fed, a member rotatably mounted on said support coaxially of and about said tube, means to rotate said member, said member having an opening coaxial with said tube, through which said brush may pass, a rotary cutter mounted for rotation on said member on an axis parallel to and offset from the rotational axis of said member and being also rotatable therewith, said cutter being located axially beyond the fixed tube and means controlled by rotation of said member, including means to rotate said cutter about its own axis for trimming the ends of bristles of the brush being fed through said tube and through the opening in said member and a blade mounted on said member and having a cutting edge against which the rotary cutter may shear the ends of the bristles.

2. In combination, a support, a tube fixed to said support through which a twisted wire brush may be fed, a member rotatably mounted on said support coaxially of and about said tube, means to rotate said member, said member having an opening coaxial with the tube, through which said brush may pass, a rotary cutter mounted for rotation on said member on an axis parallel to and offset from the rotational axis of said member and being also rotatable therewith, said cutter being located axially beyond the fixed tube, means including means controlled by rotation of said member to rotate said cutter about its own axis for trimming the ends of bristles of the brush being fed through said tube and through the opening in said member, a blade mounted on said member and having a cutting edge against which the rotary cutter may shear the ends of bristles, and means to adjust the position of the blade on said member, said blade having an inwardly curved surface extending from its cutting edge to accommodate the bristles of the brush, said rotary cutter being of the milling cutter type and comprising a plurality of radial blades.

3. The combination as set forth in claim 2, with means to adjust said cutter radially of the axis of said member.

4. The combination of claim 1, in combination with a tubular guide means fixed relative to said support and coaxial with said fixed tube and longitudinally spaced therefrom, to receive the trimmed brush, said cutter being located between said fixed tube and said tubular guide means.

5. In combination, a sleeve, means to mount said sleeve for rotation, means to rotate said sleeve, a pulley rotatably mounted on said sleeve, means to rotate said pulley, a member fixed to said sleeve and rotatable therewith, a shaft mounted for rotation on said member about an axis spaced from and parallel to the axis of rotation of said sleeve, a pulley fixed on said shaft, a belt engaging the pulley on said sleeve and the pulley on said shaft, and a rotary cutter having radial blades, fixed on said shaft coaxially thereof and rotatable therewith, in combination with a cutter blade, means to attach said cutter blade to said member, and said cutter blade having a cutting edge in shearing relation to the edges of the radial blades on said rotary cutter.

6. The combination of claim 5, in combination with means to adjust the distance of the cutting edge of said cutter blade to the rotary cutter, and the angle of the cutter blade relative to the rotary cutter.

7. The combination of claim 5, in combination with means to adjust the position of said shaft on said member radially of the rotational axis thereof and adjustable means on said member, to tighten said belt.

8. The combination of claim 5, in combination with a fixed tube telescoped within said sleeve, to guide a brush having radial bristles past said rotary cutter.

9. The combination of claim 8, in combination with a smaller fixed tube positioned to receive the brush after it has passed said cutter.

10. In combination, a support having a fixed sleeve, ball bearing means in said sleeve, a rotary sleeve supported in said ball bearing means, a fixed tube within said rotary sleeve, an annular disc fixed to one end of the rotary sleeve and rotatable therewith, a means to rotate said rotary sleeve, a pulley rotatably mounted on said rotary sleeve, a pair of shafts mounted for rotation on said disc, said shafts being diametrically opposed and parallel to the axis of said rotary sleeve, pulleys on said shafts, a belt connecting the pulley on the rotary sleeve with the pulleys on said shafts, rotary cutters on said shafts, and cutter blades on said disc tangent to said cutters.

11. The combination of claim 10, with a fixed tube coaxial with said first fixed tube and spaced therefrom, with said rotary cutters and cutter blades between the adjacent ends of said fixed tubes.

12. The combination of claim 11, in combination with means to adjust the positions of said rotary cutters relative to the axis of said disc, and means on said disc to tighten said belt.

13. The combination of claim 12, in combination with means to adjust the angles of said cutter blades relative to the rotary cutters.

14. In combination, a support, a member rotatably mounted thereon, a pair of plates, means to attach said plates to each other in spaced parallel relation at right angles to the axis of rotation of said member, means to attach said attached plates to one side of said member in radially adjusted positions relative to the axis of rotation of said member, a transverse shaft rotatably mounted on said plates in parallel relation to the axis of rotation of said member, a rotary cutter fixed to said shaft and disposed between said plates, said member having an axial opening to receive a twisted wire brush element having radiating bristles, a blade attached to said member and having a cutting edge to cooperate with said cutter for trimming the ends of the bristles of said element, means to rotate said member about its axis, and means to rotate said shaft about its own axis.

15. The combination of claim 14, and an axial sleeve fixed to said member and extending to the opposite side thereof and a tube fixed to said support and telescoped within said sleeve, through which an article to be trimmed by the cutter may be passed.

16. The combination of claim 15, in combination with a second fixed tube, coaxial with the first mentioned fixed tube, and said cutter being located between the adjacent ends of said fixed tubes.

17. In combination, a support, a rotary member, a sleeve on said member coaxially thereof and extending to one side thereof, bearing means for said sleeve, on the support, to mount said member for rotation on said support, a tube telescoped within said sleeve, means on the support to fix said tube against rotation, a cutter mounted on the other side of said member for rotation about an axis parallel to the axis of said sleeve and offset therefrom, means, including means controlled by rotation of said member to rotate said cutter about its axis of rotation, said cutter being located beyond said sleeve and tube, and a shear blade on said other side of said member having a shearing edge to cooperate with said rotary cutter.

18. The combination of claim 17, a second fixed tube coaxial with the first tube and spaced longitudinally therefrom, said cutter being located between said tubes, and the adjacent ends of said tubes being located close to said cutter.

19. The combination of claim 18, the axial distance between the adjacent ends of the tubes being no greater than the internal diameter of the first tube.

20. In combination, a support, a pair of spaced coaxial, horizontal tubes on said support through which a twisted wire brush may be moved longitudinally, a member rotatably mounted on said support about the axis of said tubes, means to rotate said member, cutting means to trim the outer ends of the bristles of said brush, eccentrically mounted for rotation on said member to cut between the inner ends of said tubes, means, including means controlled by rotation of said member, to rotate said cutting means, the inner ends of said tubes being located close to opposite sides of said cutting means, and the distance between the inner ends of said tubes being substantially equal to or less than the inner diameter of said tubes, to ensure against sagging of the portion of the brush between said tubes.



21. The combination of claim 20, said cutting means comprising a milling cutter having radial blades, and a blade having a cutting edge against which said blades may shear the ends of said bristles, the tube from which the brush is moved, being of greater internal diameter than the tube to which the brush is moved, to accommodate the brush before and after the ends of its bristles are trimmed.

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