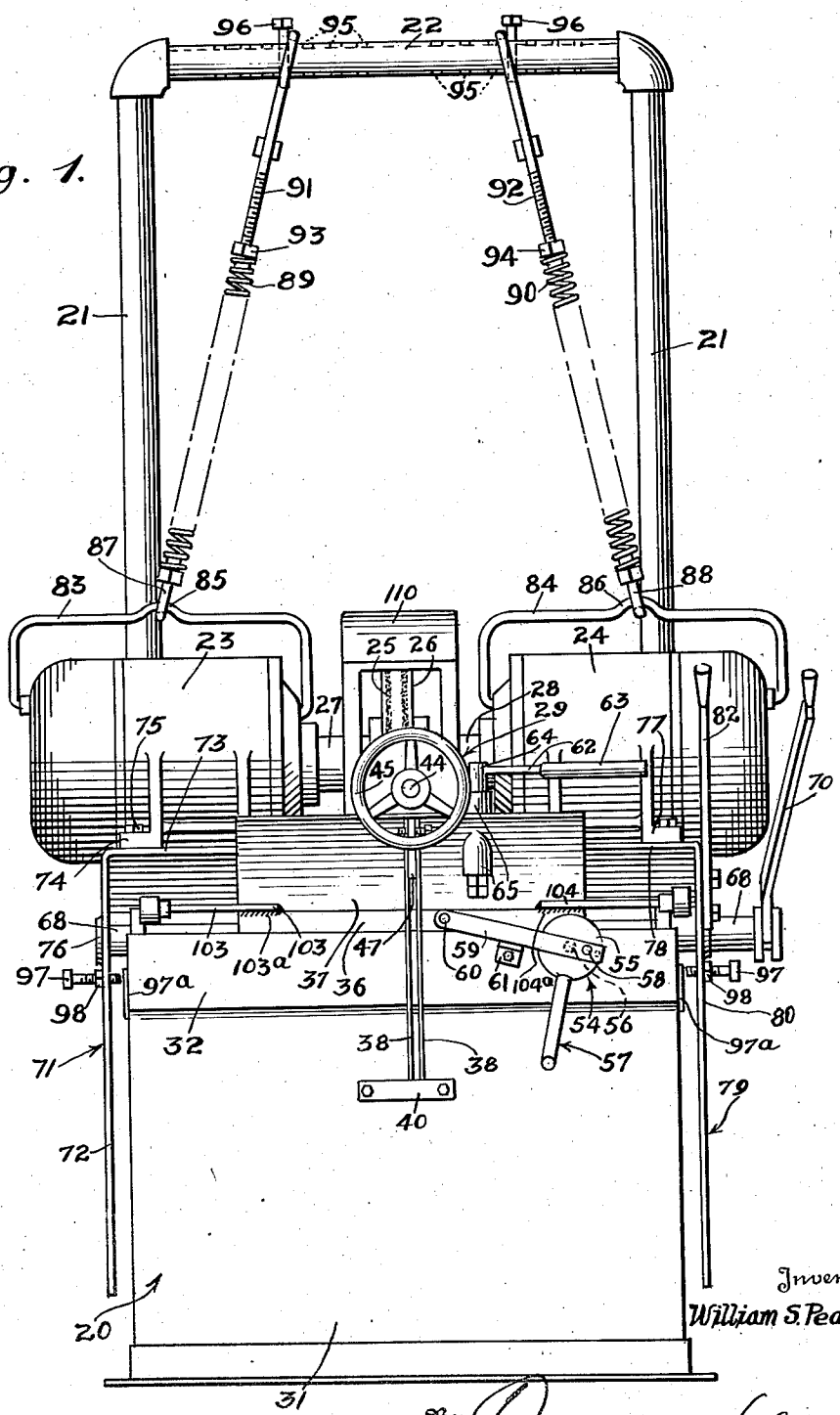
April 16, 1946. W. S. PEARSON 2,398,556

SURFACE TREATING MACHINE

Filed Feb. 28, 1944 4 Sheets-Sheet 1

Fig. 1.



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SURFACE TREATING MACHINE

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Fig. 2.

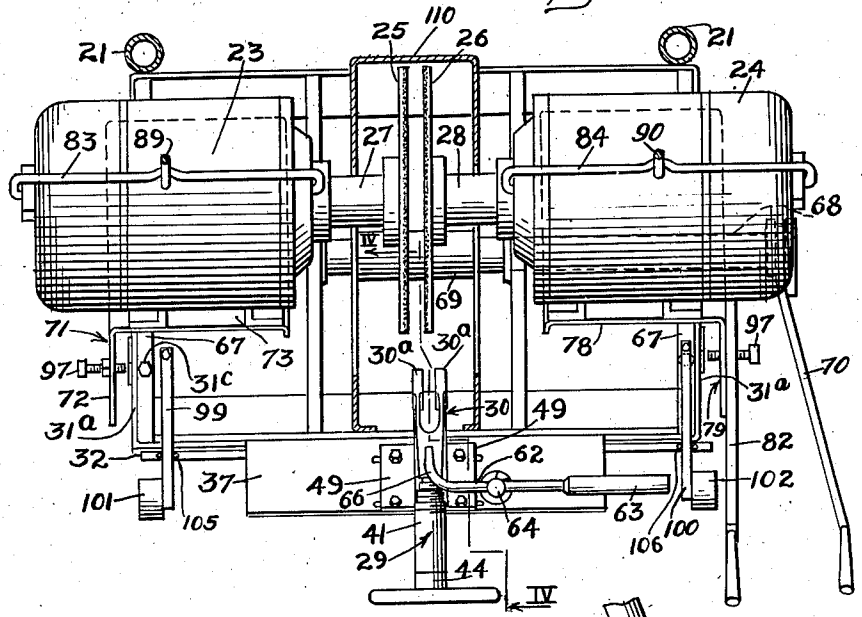
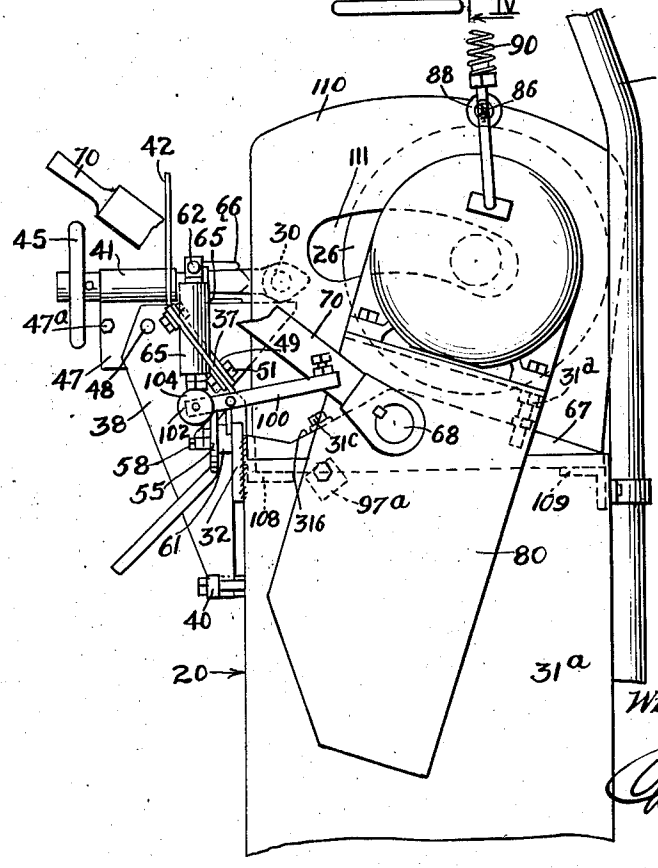


Fig. 3.



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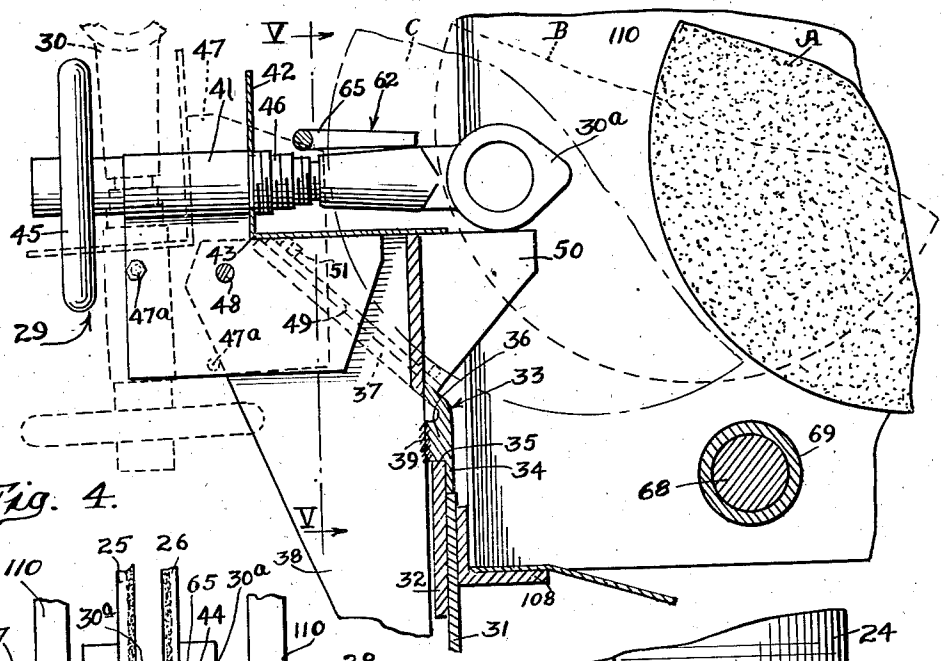


Fig. 4.

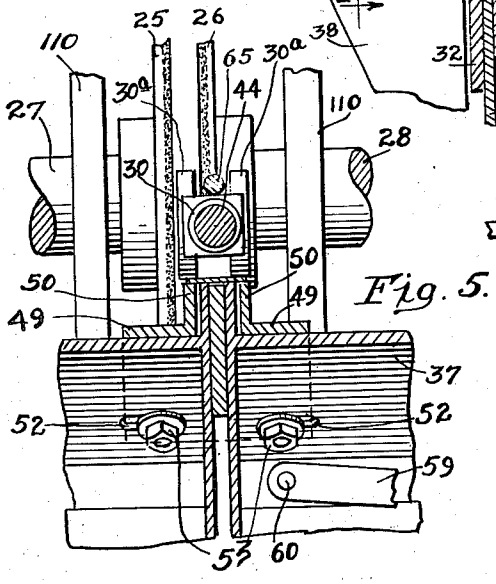


Fig. 5.

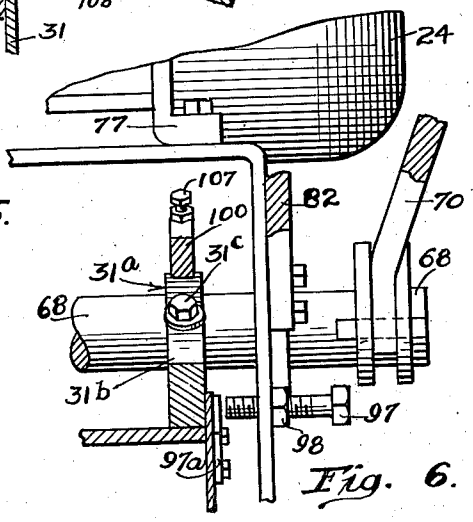


Fig. 6.

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SURFACE TREATING MACHINE

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Fig. 7.

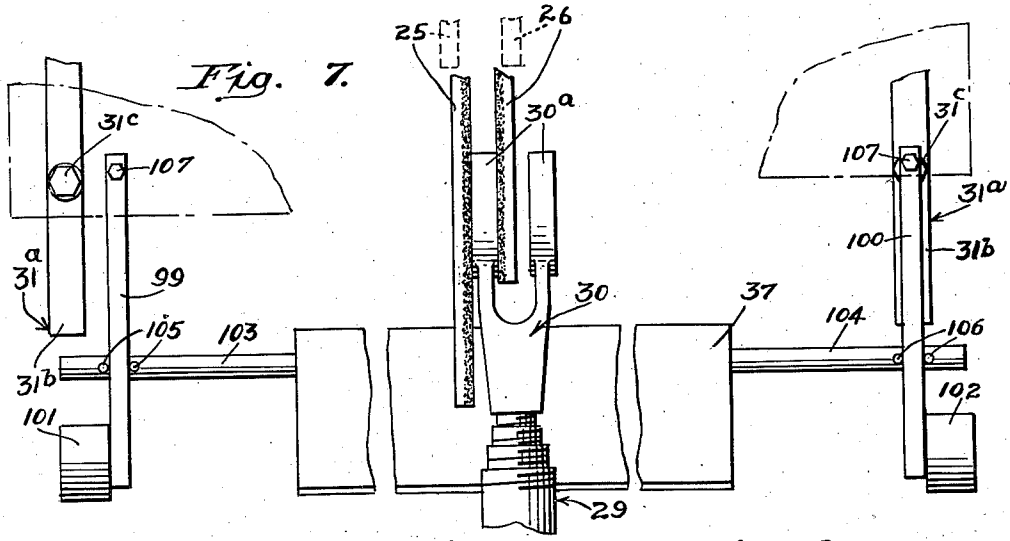


Fig. 8.

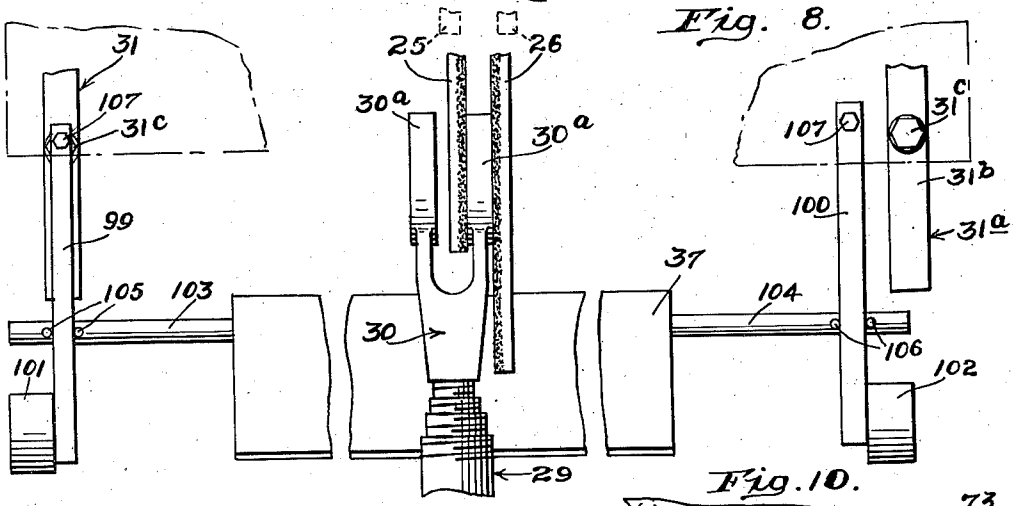


Fig. 9.

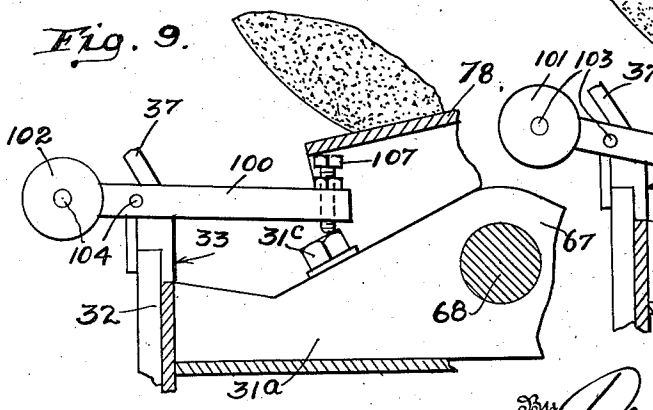
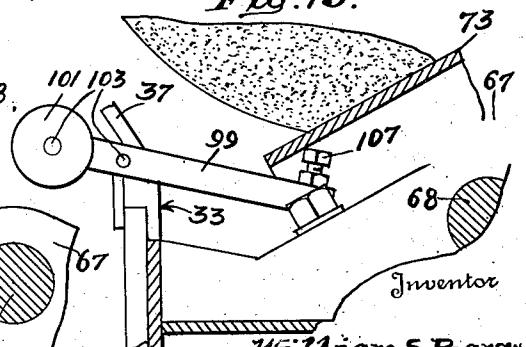


Fig. 10.



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UNITED STATES PATENT OFFICE

2,398,556

SURFACE TREATING MACHINE

William S. Pearson, Severna Park, Md., assignor to Peerco, Inc., Park Ridge, Ill., a corporation of Illinois

Application February 28, 1944, Serial No. 524,272

14 Claims. (Cl. 51—55)

This invention is directed to an improved machine for treating the surfaces of objects such as by grinding, polishing or buffing the same.

It is an important object of the present invention to provide a machine of the above character which is well adapted for so treating objects which have a multiplicity of surfaces, this machine being arranged so that a plurality of such surfaces may be treated simultaneously.

It is another object of the present invention to provide an improved surface treating machine having a plurality of operating elements for simultaneously treating surfaces of an article requiring different length work strokes.

It is still another object of the present invention to provide an improved surface treating machine having a plurality of operating elements for treating a multiplicity of surfaces requiring different length work strokes and having means for interchanging, between the elements, the different strokes so that each element is worn evenly and thus the life thereof is extended.

It is another object of the present invention to provide such a machine having a plurality of working elements together with operating means including limit members which delimit the length of the working stroke of each of the tools, the tools being so mounted that they can be quickly manipulated with respect to the delimiting members so that each tool will assume the working stroke previously passed through by another. In other words, there is provided herein an arrangement of limiting means whereby the stroke length of the tools can be interchanged for successive operations.

By way of exemplification of my invention, the machine shown herein is adapted for surface treating a forked member such as a cable end having a pair of parallelly extending, spaced legs, each leg being provided with a boss through which connection receiving apertures are drilled. In manufacturing such a device it is necessary to smooth down the sides of the bosses after the drilling operation, this smoothing operation being performed heretofore on a milling machine. Preferably the opposite sides of each of the prongs are treated together so that working pressures are in opposite directions. The treatment of the outer surface of one of the prongs requires a relatively long stroke of the tool or disk, while the treatment of the inner surface can be accomplished only by a relatively short stroke of the tool. In other words, the grinding area on the inner and outer surfaces of each of the bosses may be of different dimension. Thus it will be seen that when the surface treating disks operate on one of the bosses, one of the disks will pass through a longer stroke and the other through a shorter stroke. On the other hand, when the device is moved relative to the device so that the disks can operate on the other boss, the disk which formerly operated through a longer stroke on the outer side of the first boss must now operate through a shorter stroke on the inner side of the second boss. Likewise the disk which formerly passed through a shorter stroke on the inside of the first boss must now pass through a longer stroke on the outside of the second boss.

Accordingly, it is another important object of the present invention to provide apparatus of the above character with a plurality of surface treating implements, each of which is adapted to be operated through a working stroke of different length than that through which the other passes, therealso being provided means for varying the stroke length of each implement so that each may be made to assume the stroke of the other during a successive operation.

It is another important object of the present invention to provide an apparatus having the above characteristics and yet in which there is provided for each of the implements a direct driving connection to a source of power.

It is a further object of the invention to provide a novel delimiting arrangement whereby the working stroke of each of the disks is changed with each shaft in the device being worked upon.

Still another object of the present invention is to provide an improved supporting structure for the movable implements whereby a minimum of force is required to urge the same through a working stroke and whereby the efforts of the operator are thus available almost entirely for accomplishing the movement of the implements through their working stroke against the work piece.

In accordance with the general features of the present invention there is provided therein an improved grinding, polishing or buffing machine having a stationary base and a work holding assembly, said assembly being mounted in laterally shiftable relationship to the base, direct drive motors and opposed disks therefor and means for rocking or oscillating the disks and motors toward and away from the work and thus over the surfaces to be treated, one of the disks being delimited to a shorter stroke and the other passing through a deeper stroke, said machine also including novel delimiting means operable

with the shiftable work holding assembly to alternately delimit the working stroke of first one of the disks and then the other disk upon shifting thereof with the work holding assembly.

Other objects and advantages of the invention will become apparent from the following description and accompanying drawings in which:

Figure 1 is a front view of a machine embodying my invention;

Figure 2 is a top plan view of the machine shown in Figure 1 with certain parts broken away;

Figure 3 is a side view of the machine taken from the right-hand side of Figure 2;

Figure 4 is a fragmentary cross-sectional view taken on the line IV—IV of Figure 2;

Figure 5 is a fragmentary cross-sectional view taken on the line V—V of Figure 4;

Figure 6 is a fragmentary detail view of the motor mounting and delimiting device;

Figure 7 is a fragmentary plan view of certain parts of the device showing the relative positions of the surface treating implements;

Figure 8 is a view similar to Figure 7 showing the succeeding position of the implements;

Figure 9 is a fragmentary transverse sectional view showing the position of certain of the parts delimiting one of the implements to a short stroke; and

Figure 10 is a view similar to Figure 9 showing the position of the parts when one of the implements passes through a longer stroke.

It is to be understood that the embodiments shown herein may be varied or modified without departing from the spirit and scope of the invention as set forth in the appended claims.

Referring particularly to Figure 1, the device generally consists of a base **20** provided with a superstructure including vertical standards **21** extending upwardly from the rear side thereof, these standards being bridged at their upper ends by a cross piece **22**.

The base **20** and the upper cross piece or bridge member **22** serves to support the grinding assembly which includes a pair of motors **23** and **24** directly connected to a pair of grinding disks **25** and **26**, respectively, through drive shafts **27** and **28**, respectively.

As will be explained presently, the motors **23** and **24**, together with their appurtenances, are rockingly mounted on the base **20** to be moved forwardly and rearwardly, independently of one another to perform a surface treating operation. As will also be explained in detail presently there is provided a work holding structure shown generally at **29** which is laterally, slidably mounted upon the base **20** and is thus movable laterally relative to the surface treating assembly to successively expose varying surfaces of the work piece **30** to the surface treating operation.

It is to be understood that the various specific details and the structural features utilized in the present embodiment of my invention, while highly satisfactory for accomplishing the purposes of my invention may be varied, and certain other mechanical expedients may be used which also utilize the general principles of my invention.

The base **20** shown herein is essentially box-like in formation and is made up preferably of four heavy sheet steel plates which provide a neat, easily maintained, rigid supporting structure. Referring specifically to Figures 3 and 4, it will be seen that there is suitably secured to the upper side of the front base plate **31**, as by welding or the like, a cross plate **32** which, as will be seen presently, serves to slidably retain the work holding assembly **29** in the assembly shown.

As will best be seen from Figure 4 the work holding assembly **29** is slidably secured to and maintained upon the base structure **20** by means of a supporting member **33**. This supporting member **33** includes a downwardly depending flange part **34** which overlies the upper part of the rear surface of the cross plate **32**, there being a shoulder **35** formed in the member **33** at the upper end of the depending part **34**. This shoulder slidingly abuts against the upper edge of the plate **32** which serves as a sliding track therefor. The member **33** is also provided with an intermediate heavy portion **36** and a generally obliquely disposed, upwardly and outwardly extending portion **37**. It will be seen that the outer surface of the enlarged portion **36** is in a plane lying outwardly of the outer surface of the plate member **32** and thus a pair of vertically extending braces **38** may have the adjacent portion of their inner edges welded to the outer surface of the enlarged portion **35** of the member **33** as shown at **39** in Figure 4.

These brace or supporting members **38** are preferably wider at the upper end and tapered rearwardly toward the lower end thereof, whereby the lower ends may be slidingly fitted behind a holder **40** attached to the front plate **31** of the base **20**.

The work holder **29** itself includes a sleeve **41** non-rotatably mounted in an upstanding plate **42** which is secured in turn to a horizontal plate **43**. Within the collar or sleeve **41** is rotatably and non-slidably mounted a shaft **44** having at its outer end a handwheel **45** and at its inner end a plurality of sets of graduated threads **46** which are adapted to be screwed into the threaded end of a fitting to be worked upon and also to be removed from the fitting by rotation of the handwheel **45**. The plates **42** and **43** are secured as by welding or the like to a plate such as that shown at **47** in Figure 4, the plate **47** being disposed between the supports or braces **38** and being pivotally secured thereto as by a pin **48**. With this construction it will be seen that the threads **46** together with the fitting **30** secured thereto may be rocked into an upright position such as shown by the dotted lines in Figure 4, this rocking movement being about the pin **48** and being limited by bolt **47a** in plate **47** which engages the edges of supports **38**. When in this position the fitting may be exchanged for another to be subsequently worked upon. Thereafter the operator, after he has turned the handwheel **45** sufficiently to secure the fitting tightly on its respective set of threads **46**, may rock the entire assembly on the plate **47** forwardly into the position shown in full lines in Figure 4.

To the end that this forward rocking movement may be delimited to the desired degree there is provided herein on the oblique portion **37** of the member **33**, a pair of opposed stop members each of which includes a portion **49** terminating inwardly in vertically disposed plate sections **50** which are each preferably aligned to supportingly abut one of the bosses **30a** of the fitting **30** being worked upon.

The portions **49** of the delimiting members are preferably maintained upon the oblique portion **37** of the supporting member **33** by means of suitable bolts **51**, the shanks of which extend through laterally disposed slots **52** in the member **37**. Thus, when the nuts **53** of these bolts are loosened, the plate portions **50** may be drawn closer toward one another or spread further apart in

order to accommodate fittings having bosses which are spaced differently from those previously worked upon. Likewise different size fittings may be attached to the work supporting mechanism in a manner previously described because of the graduated sets of threads 46.

From the foregoing it will be seen that there is slidably mounted, for movement across the machine, on the base 20 thereof, a work carrying and manipulating assembly 29 which includes supporting members or braces 38, the sleeve 41 mounted upon the angle member made up of plates 42 and 43, the shaft member 44 rotatably mounted in the sleeve and carrying the manipulating hand or wheel 45 and threads 46, all of which are mounted upon plates 47; which assembly is in turn pivotally secured as at 48 between the braces 38, and the upstanding plates 50, the latter being of less thickness than the bosses 30a of the fitting and being aligned therewith.

For purposes to be described more fully presently, it is desirable to first grind the opposed sides of one of the bosses 30a of the fitting and then subsequently to shift the entire work holding mechanism 29 to bring the surfaces of the other boss into alignment with the path of the surface treating implements 25 and 26. Accordingly, it will be seen that movement of the above described assembly laterally will accomplish this purpose.

Such movement is attained herein by means of an eccentric assembly 54 shown best in Figure 1. This assembly includes a disk 55 rotatably mounted at its center as shown at 56 to the plate 32 mounted at the upper end of the front plate 31 of the base 20. This disk is provided with a crank handle 57 by means of which it may be rotated as desired. Connected off center of the disk 55 as at 58 is one end of a pitman 59, the other end of which is pivotally secured as at 60 to the outer face 36 of the enlarged portion of the member 33 slidably mounted upon the plate 32 as previously described. Preferably a stop bracket 61 is bolted to the outer surface of the plate 32 in such a position that it engages the pitman 59 to precisely position the respective bosses 30a of the tool in readiness for surface treatment in a manner to be described presently.

In Figure 1 it will be seen from the misalignment of the center of the handwheel 45 with the grinding disks 25 and 26 that the left-hand boss 30a of the fitting is aligned therebetween. This position is identical to that shown in Figure 2. After the grinding or finishing operation has been performed on the left-hand boss in a manner to be described presently, it will be seen that movement of the handle 57 of the eccentric disk 55 in a counter-clockwise position will shift the supporting member 33 together with the work holding assembly 29 described above, to the left, whereupon the right-hand boss 30a of the tool is brought into alignment to be worked on by the disks 25 and 26. During this movement it will be seen that the pitman 59 has had the right-hand end thereof raised and moved to the left, whereby it has moved these parts as indicated.

To the end that the fitting 30 may be held tightly in its horizontal position as shown in Figures 2, 3 and 4 and so that the fitting will not shift under the influence of the action of disks 25 and 26, there is provided an arm 62 having a handle 63. This arm is mounted upon a vertical member 64 which is pivotally secured through a boss 65 formed in the obliquely disposed portion 37 of the supporting member 33. The remote end of the arm 62 is preferably curved as shown at 66, this curved portion overlying the upper side of the fitting to hold it tightly down in its horizontal position and into its abutting engagement with the respective plates 50 which underlie each of the bosses 30a.

When the surface treating operation is completed the operator merely swings the handle 63 outwardly, whereupon the remote end of the arm 62 swings out of its overlying engagement with the fitting to permit the manipulation of the handwheel 45 and the appurtenant parts, together with a fitting, into the vertical position shown in dotted lines in Figure 4.

As indicated previously, the motors 23 and 24, together with their respective grinding disks 25 and 26 are mounted in the mechanism so that they may be swung forwardly and rearwardly to carry the respective disks through an oscillatory working stroke against the respective surfaces of the bosses 30a of the fitting 30 being worked upon. As will best be seen from Figure 3 the side plates 31a of the base 20 are each provided with a centrally upstanding portion 67 through which extends a rocking rod assembly for the motors. This rocking rod assembly as best shown in Figure 4 includes a rod 68 which is provided with an operating lever 70 that is suitably keyed thereto. This rod 68 extends entirely across the machine as best shown in Figure 1. Rocking movement imparted to the rod 68 by manipulation of the lever 70 is imparted to the motor 23 and the respective disk 25 by virtue of the mounting arrangement for that motor and the association thereof with the rod 68.

To this end the motor 23 is mounted upon a generally L-shaped mounting element 71 having a vertically extending leg portion 72 disposed on the outside of the base 20 and a substantially horizontal motor receiving portion 73 extending inwardly over the left-hand side of the base as viewed in Figures 1 and 2. The motor 23 is provided with the usual mounting lugs 74 which are secured, by means of bolts 75 to the horizontal portion 73 of the mounting member 71. The mounting member 71 is supported in the position shown by virtue of the extension of the remote end of the rod 68 through the skirt portion 72 thereof as shown best in Figure 1. The rod 68 being enlarged as at 76 to maintain the attached relationship and preferably the rod 68, is keyed to the mounting member 71 in any suitable manner so as to permit a slight lateral movement of the motor 23 and its mounting member 71 thereupon. If desired, suitable means may be provided for rockingly supporting the inner portion of the horizontal member 73 such as, for instance, the inner end thereof may be bent downwardly and recessed to receive the upper portion of the rod 68. With such a construction it will be seen that the parts are entirely open and thus may be easily cleaned and maintained and at the same time the mounting member 71 is keyed to the rod to be rocked forwardly and rearwardly by movement of the handle 70 while the mounting member 71 together with the motor 23, may slide laterally for purposes to be described presently.

The motor 24 is similarly mounted in that it is secured by means of mounting lugs 77 to a horizontal portion 78 of a rockable mounting member 79 having a downwardly depending part 80 similar to that shown at 72 in the case of the mounting member 71 for the motor 23. In order that the mounting member 79 together with the motor 24 may be rocked forwardly and rearward-

ly independently of the movement of the motor 23 and in order that the motor 24 with its mounting member 79 may shift slightly laterally upon its rocking mechanism, the depending portion 80 of the mounting member 79 is adapted to rotatably receive the rod 68. In this instance it is to be noted that the mounting member is not keyed to the rod 68 but may rock freely thereon and may shift slightly laterally thereon. In this portion of the assembly there is provided a manipulating handle 82 which is securely bolted to the upper portion of the depending section 80 of the mounting member 79. Thus it will be seen that rocking movement imparted to the lever 82 will directly effect the mounting member 79 and rock the same freely upon the rod 68. If desired, the inner portion of the horizontal section 78 of the mounting member 79 may be constructed to supportingly abut an inward, aligned part of the rod 68 in the manner previously described in conjunction with the horizontal portion 73 of the mounting member 71.

From the foregoing it will be seen that there is provided herein an apparatus including a base 20 upon which is mounted a work holding mechanism 29, this work holding mechanism being reciprocable laterally in the apparatus relative to the base to dispose various parts of the work successively in a position to have the surfaces thereof buffed, ground or polished. As will be seen from Figure 2, when the eccentric mechanism 54 is in the position shown in Figure 1, the left-hand boss 30*a* of the fitting 30 is aligned between the grinding disks 25 and 26. After the grinding or other surfacing operation has been performed in a manner to be explained presently upon the last mentioned lug, it will be seen that the handle 57 may be manipulated as previously described, whereupon the other lug 30*a* is brought into operating position and disposed between the disks 25 and 26. Thereafter the operation may be repeated upon this second lug. Also it will be seen that there is provided herein a stationary base upon which the motors together with their respective disks are mounted for rocking forwardly and rearwardly to perform the surface treating operation, this rocking operation being independent in each of the respective motors and disks. It will also be seen that a slight amount of lateral play is permitted between the rocking bar 68 and the respective motors, thus permitting an efficient grinding or buffing operation in a manner to be explained presently.

To the end that the motors 23 and 24 may be additionally supported and also to the end that the motors, together with their respective disks may be urged resiliently toward one another during the grinding, buffing or polishing operation, each is provided with a hanger 83 and 84 respectively. These hangers are arranged to swingingly engage in suitable apertures in opposite ends of the respective motors and are each provided with offset portions 85 and 86 in the bridging portions thereof respectively.

Engaged in the offsets 85 and 86 are grappling elements 87 and 88, respectively which comprise the lower ends of springs 89 and 90 respectively. These springs are each provided with bolts 91 and 92 respectively at the upper ends thereof which are formed to grapple the cross bar 22 of the super structure of the apparatus. From Figure 1 it will be seen that the bolts 91 and 92 are secured to the respective springs by nuts 93 and 94 which, when rotated, will progress upwardly or downwardly on the respective bolt to vary the tension of the respective spring. The cross piece 22 of the super structure is provided with a plurality of apertures 95 in the upper side thereof, these apertures being arranged to receive suitable pins such as those shown at 96 which serve to retain the upper ends of bolts 92 inwardly of the lower ends of the spring. Further adjustment of the tension of the springs and particularly of the tendency thereof to draw the motor and the respective disks 25 and 26 inwardly toward one another and against the work may be accomplished by setting the pins 96 into holes nearer the center of the cross piece 22 or into outwardly disposed holes 95.

With the foregoing construction it will be seen that several advantages are derived by the spring arrangement shown herein. First, the springs tend to support the motors and thus relieve the operator of much effort in moving the same during the manipulation of handles 70 and 82 to rock the motors and the disks toward and away from the work. In other words, the springs balance against the weight of the motors and disks. Second, the springs, when the motors in their rearward position and at rest as shown in Figure 3, permit the disks 25 and 26 to spread slightly apart from one another and also tend to urge the disks toward one another as tension thereon is increased by forward movement of the motors and disks into operative position. The practical advantage of this feature of the spring assembly is that the disks tend to abut the surfaces of the respective bosses resiliently and thus are spring pressed, in effect, against the surface being worked upon rather than being rigidly mounted so as to cut off, in a single stroke, a certain thickness progressively from the surface being worked upon. This feature has been found to accomplish the desired results very effectively and yet greatly increase the life of the surface treating implements particularly if the implements are grinding wheels as disclosed herein.

It will be seen that in view of the lateral play of the motors and the disks during the surface grinding operation, and due to the resiliency imparted to the contact between the disks and the work, some means must be provided for delimiting the inward movement of the disks toward one another under the influence of the springs so that the depth of the grinding is delimited to a desired degree, thereby leaving the finished lug 30*a* with a predetermined thickness.

To this end each of the downwardly depending portions 72 and 80 of the motor mounting members 71 and 79 is provided with a stop bolt 97 each of which is provided with a lock nut 98, whereby it may be secured tightly, in a given, set position. Thus it will be seen that if the nuts 98 are loosened and then the bolts 97 are each screwed outwardly a slight distance the springs will be enabled to draw the motor mountings together with the motors and the respective disks inwardly to a greater degree, thereby to grind a greater depth from the surface of the bosses 30*a* respectively, whereby these bosses are made thinner by the grinding operation. Likewise it will be seen that if a lesser depth is to be ground from the surface of the bosses or a lighter polishing pressure is desired, the bolts 97 may be screwed further inwardly of the respective parts on which they are mounted. Thus the inward movement of the motor mountings and the motors together with their disks under the influence of the supporting springs 89 and 90 is delimited. It will be understood of course that the bolts 97 may be calibrated in any suitable manner whereby predetermined distances

between the working faces of the disks may be obtained quickly and easily. From Figure 1 it will be seen that, if desired a hardened abutment plate 97*a* may be provided on each side of the base 20 for each of the bolts 97.

From the foregoing it will be seen that there is provided herein a surface treating apparatus which includes a work holding assembly so arranged that the work may be shifted with precision to align different surfaces thereof in a surface treating position successively, for successive grinding, polishing or buffing operations. There is also included, a novel arrangement for opposed grinding, buffing, or polishing disks, these disks being movable forwardly and rearwardly, into and out of surface treating position and yet being driven by a direct drive from a respective motor. The arrangement also includes means for permitting a certain amount of play in the disks and yet resiliently urging the disks toward one another a predetermined, regulated amount which is delimited when the desired thickness of material has been ground from the device being worked upon or when the buffing or polishing pressure has reached a predetermined intensity.

Another aspect of the present invention is directed to increasing the life of the working medium upon the face of the disks 25 and 26. It will be understood that if the width of the surfaces on bosses 30*a* as viewed in Figures 7 and 8 are less than the radial depth of the surface on the respective disks and the disks are moved forwardly into working contact with the device being ground only sufficiently far to utilize a peripheral margin of substantially the width of the surface being ground, then the grinding implement will deteriorate over this portion of the surface while the inner part thereof remains intact. Furthermore, as in the present instance, because of the yoked formation of the fitting 30, one of the disks (that grinding the outer surface of the respective boss) may move further forward than the opposite disk which is simultaneously grinding the inner surface of that boss.

If this condition prevails for each of the successive grinding operations, it will be seen that one of the disks will likewise be worn only at the outer peripheral part thereof, while the other is worn more evenly due to the further progressive movement thereof over the outer side of the boss. It is this condition which is availed of in the present invention to increase the life of both the disks by an alternating arrangement to be described presently. This alternating arrangement, it is to be noted, permits each of the opposed grinding disks to be subjected alternately to different grinding strokes and thus, while the successive stroke of each disk is different, the alternating from one character of stroke to the other results in an overall operation, whereby each disk is utilizing its entire surface during the grinding cycle and each is passing through a cycle identical to the other so that one does not wear before the other nor does one wear unevenly as to the other.

To the end that the oscillating, working strokes of the disks 25 and 26 may be alternated as above described, there is provided herein as best shown in Figures 7 and 8, a pair of spaced rocking arms 99 and 100. These arms are weighted at their outer ends as shown at 101 and 102 and are rockingly secured on rods 103 and 104 respectively, which extend therethrough. To the end that the arms 99 and 100 may not shift laterally upon the rods 103 and 104, sets of stop pins 105 and 106 are arranged on each side thereof respectively. The weights 101 and 102 are of such magnitude that they tend to rock the arms into a position shown in Figure 4, wherein the inner ends thereof are elevated.

As best shown in Figure 1 the rods 103 and 104 are welded to the laterally slidable work supporting assembly 29 as at 103*a* and 104*a* respectively. It will be noted that the arms 99 and 100 are spaced apart a distance less than the distance between the forwardly inclined edges 31*b* at the upper part of side panels 31*a* of the pedestal or support 20. The spacing between the arms 99 and 100 is such that when the work holding assembly 29 is shifted to the right as shown in the drawings, the arm 100 is in alignment with the right-hand side or panel 31*a* and thus in alignment with the stop nut 31*c* protruding from the respective inclined surface 31*b*. On the other hand, when the work holding assembly 29 is shifted to the left in order that the disks 25 and 26 may operate upon the other lug of the fitting, the positions of arms 99 and 100 are reversed in that the arm 100 is drawn out of alignment with the respective stop nut 31*c* while the arm 99 is moved into alignment with its respective stop nut 31*c* at the left of the apparatus.

By reference to Figures 3, 9 and 10, it will be seen that when the arm 100 is aligned with the respective side wall or panel 31*a* as shown in Figure 9, it will serve as a stop or wedge between the respective stop nut 31*d* and the respective motor mounting base 78 to limit the forward movement of the respective motor and disk under the influence of manipulation of the handle 70. As will best be seen in Figures 9 and 10, the disposition of bolts 107 through the ends of arms 99 and 100 permits a variation of the limited strokes of the respective disks depending upon the degree to which the bolts are screwed into or out of the ends of the respective arms. As will be seen in Figure 10, when the arm 99 is in the position in Figure 7 the bolt 107 thereof will not be interposed between the respective motor base 73 and the respective inclined surface 31*b* and thus manipulation of the lever 82 will enable the disk 25 to be rocked forwardly into an extreme position as shown in Figure 7 so that the surface treating operation will be accomplished over the radially inner portion of the abrading surface thereof. Thus it will be seen that in the first of two successive operations required to surface both of the bosses 30*a* of the fitting 30, the inner portion of the disk 25 will be utilized while the outer portion of disk 26 will be utilized by virtue of the interposition of the end of arm 100 between the motor base 78 and the upper, forwardly inclined edge 31*b* of the respective side panel 31*a*. After this operation is completed, the motors are oscillated rearwardly by reverse manipulation of levers 70 and 82, whereupon the operator then manipulates the handle 57 in a counter-clockwise position from the position shown in Figure 1 to shift the fitting into the alignment shown in Figure 8. With this movement it will be seen that rods 103 and 104 have carried arms 99 and 100 to the left also, whereby arm 99 is now brought into alignment with the respective side panel 31*a* while the arm 100 is moved out of alignment with its respective panel 31*a* so as to be forced into the extreme lower position by oscillation of the motor base 78 similar to the position of arm 99 as shown in Figure 10. Thus in this instance and as shown by the

position of the disks in Figure 8, the disk 25 abrades the right-hand boss with the radially outer margin thereof, while the disk 26 abrades the other side of the boss with the radially inner margin thereof.

Accordingly, it will be seen that by these successive operations each of the disks has an equal amount of abrasion applied to similar parts thereof. In this manner the disks are worn down each across their entire surfaces and each an equal amount since they are subjected to similar treatment. In this manner it will be seen that unevenness does not develop in the disks during use and thus a true ground surface may always be attained.

As indicated previously, one of the attributes of the above described arrangement is that each of the disks serves as a backing for the operation being performed by the other in that they mutually support the boss being worked upon. In this regard, and as also indicated previously, it is highly desirable that the grinding, polishing or buffing operation be accomplished by a plurality of oscillatory movements of the respective disks rather than by a single working stroke. In this manner the resilient mounting of the motors is utilized to obtain resilient working pressures of the disks against opposite faces of each boss and thus the grinding or polishing operation is characterized by a less intense pressure between the work and the disk, the degree of surface finishing being accomplished by an increase in the number of strokes or in the duration of time during which the disk is held against the surface being worked upon. This factor greatly increases the life of the material on the disk and is found to increase the time required from the surface treating operation only a very slight amount.

The course of movement of the respective disks is shown schematically in plan view in Figures 7 and 8, the dotted line positions representing the disposition of the disks when at rest. When in this position it will be noted that the disks are spread apart from one another an amount slightly greater than that when they are in operative position against the respective boss.

In Figure 4 the position of the disks at rest is shown in full lines, the position of the disks passing through the short strokes is shown in dotted lines, and the position of the disks passing through the longer strokes is shown in the broken chain line as at A, B and C, respectively.

As shown best in Figures 1, 2 and 4, the inner surfaces of the front and rear plates or panels of the base 20 may be provided with front and rear angle members 108 and 109 respectively, these angle members being arranged to receive the lower edges of the front and rear of a central hood member 110 which houses the disks 25 and 26 and has an open front so that the disks may pass therethrough during their working stroke. This hood serves admirably as a spark catcher and as a protection for the operator against accidental engagement with the rotating disks. In order to accommodate the oscillating movement of the motor shafts 27 and 28, the sides of the hood as shown best in Figure 3 are arcuately slotted as at 111 to accommodate the oscillations of these shafts.

As will also be seen from Figure 3, the rearwardly inclined upper edge of the side panels 31*a* of the base 20 may, if desired, be provided with stop bolt arrangements 31*d* which may be adjusted to delimit the rearward or rest position of the motor mounting members 71 and 79 and the respective motors 23 and 24.

If desired, the plates 97*a* may serve as cam members to positively urge the respective mounting members 71 and 79 together with the respective motors and disks outwardly away from one another against the spring action when the motors and disks together with their mounting members are in a position of rest so that the bolts 97 are aligned therewith.

I claim as follows:

1. In a surface treating machine, a supporting assembly including a base and a superstructure, a work holding assembly including means for mounting the same laterally slidingly on the base and a surface treating assembly including a plurality of motors mounted in axial alignment and to move forwardly, independent of one another and having surface treating disks mounted on the shafts thereof in opposed, spaced relationship to receive a work piece therebetween so that a plurality of opposed surfaces on said work piece may be treated simultaneously, a rocking bar mounted on said machine and disposed in parallel relationship with the shaft axis of said motors, independent mounting members for each of said motors, each including a part for supporting a motor and a part for receiving said rocking bar therethrough, one of said mounting members being keyed to said bar so as to rock therewith and another of said mounting members being arranged to rock relative to said bar, means for rockingly manipulating said last named mounting member and means for rockingly manipulating said bar with the first named mounting member and the motor thereon, a stop assembly for alternately delimiting the rocking movement of said mounting members and the respective motor associated therewith, said stop assembly including a spaced, rockable stop member for each motor mounted on said work holding assembly to move laterally therewith, and abutment members for engaging said stop members, said abutment members being so spaced that only one thereof is in alignment with the respective stop member for each lateral position of the work and so that the other is in alignment with its respective member when the work holding assembly is shifted laterally for a successive operation upon other surfaces of the work piece, whereby each motor and the respective disk thereof passes through alternate limited and long strokes when rocked into surface treating engagement with the work piece, and resilient supporting means for said motors including a spring having the upper end secured to said superstructure and the lower end biased away from the opposed disks and connected with the respective motors thereby to urge said motors into a retracted position away from the work and to bias said disks toward one another during the surface treating operation.

2. In a surface treating machine, a supporting assembly including a base, a work holding assembly including means for mounting the same laterally slidingly on the base and a surface treating assembly including a plurality of motors mounted in axial alignment and to move forwardly, independently of one another and having surface treating members mounted on the shafts thereof in opposed spaced relationship to receive a work piece therebetween so that a plurality of opposed surfaces on said work piece may be treated simultaneously, independent, rockingly supported mounting members for each of said motors, a stop assembly for alternately de-

limiting the rocking movement of said mounting members and the respective motor associated therewith, said stop assembly including a spaced, rockable stop member for each motor mounted on said work holding assembly to move laterally therewith, and abutment members for engaging said stop members, said abutment members being so spaced that only one thereof is in alignment with the respective stop member for each lateral position of the work and so that the other is in alignment with its respective member when the work holding assembly is shifted laterally for a successive operation upon other surfaces of the work piece, whereby each motor and the respective surface treating member thereof passes through alternate limited and long strokes when rocked into surface treating engagement with the work piece.

3. In a surface treating machine, a supporting assembly including a base, a work holding assembly including means for mounting the same laterally slidingly on the base and a surface treating assembly including a plurality of motors mounted in axial alignment and to move forwardly, independently of one another and having surface treating members mounted on the shafts thereof in opposed spaced relationship to receive a work piece therebetween so that a plurality of opposed surfaces on said work piece may be treated simultaneously, independent, rockingly supported mounting members for each of said motors, a stop assembly for alternately delimiting the rocking movement of said mounting members and the respective motor associated therewith, said stop assembly including a spaced, rockable stop member for each motor mounted on said work holding assembly to move laterally therewith, and abutment members for engaging said stop members, said abutment members being so spaced that only one thereof is in alignment with the respective stop member for each lateral position of the work and so that the other is in alignment with its respective member when the work holding assembly is shifted laterally for a successive operation upon other surfaces of the work piece, whereby each motor and the respective surface treating member thereof passes through alternate limited and long strokes when rocked into surface treating engagement with the work piece, and means for urging said surface treating members resiliently toward one another and against opposed sides of the work during the surface treating operation.

4. In a surface treating machine, a supporting assembly including a base, a work holding assembly including means for mounting the same laterally slidingly on the base and a surface treating assembly including a plurality of motors mounted in axial alignment and for forward and rearward rocking movement and having surface treating members mounted on the shafts in opposed spaced relationship to receive a work piece therebetween so that a plurality of opposed surfaces on said work piece may be treated simultaneously, means for delimiting the forward movement alternately of one and then another of said motors during surface treating strokes thereof including a pair of limit members arranged to slide laterally with said work holding assembly, one of said limit members being aligned with each of said motors, said limit members being so spaced and arranged that in one position of the work holding assembly one of said limit members serves to delimit the stroke of the respective motor and in another position of the work holding assembly another limit member delimits the stroke of its respective motor, said first named limit member then affording full oscillatory movement of its respective motor.

5. In a surface treating machine, a work holding assembly for maintaining a work piece in a position to be treated, a surface treating assembly including axially aligned motors each having a surface treating disk member on the shaft thereof, each of said disk members being disposed in facing, spaced opposed relationship, said work holding assembly being arranged to maintain a work piece so that opposed surfaces thereof are aligned between said disks, means for mounting said motors and said disks for oscillatory motion toward and away from said work piece, whereby said disks each treat an adacjent surface of said work piece and each serves as a backing for the other during the surface treating operation, said machine also including means for shifting the work piece laterally after each successive surface treating operation and means for delimiting the oscillatory stroke of one of said disks during the surface treating operation, said last means being arranged to delimit the stroke of each motor alternately, whereby each disk travels through a shorter and a longer stroke alternately with each succeeding surface grinding operation.

6. In a surface treating machine for treating opposed surfaces of an article, a pair of axially aligned motors having surface treating disks disposed at the ends of the shafts thereof, said disks being arranged in spaced, facing relationship, means for mounting said motors and said disks for forward and rear oscillatory movement, a work holding assembly on said machine mounted in laterally slidable relationship thereto and means for moving said work holding assembly laterally to afford disposition of one set of opposed surfaces thereof in registration with the space between said disks and subsequent disposition of another set of surfaces thereof in registration with said space.

7. In a surface treating machine for treating opposed surfaces of an article, a pair of axially aligned motors having surface treating disks disposed at the ends of the shafts thereof, said disks being arranged in spaced, facing relationship, means for mounting said motors and said disks for forward and rear oscillatory movement, a work holding assembly on said machine mounted in laterally slidable relationship thereto and means for moving said work holding assembly laterally to afford disposition of one set of opposed surfaces thereof between said disks and subsequent disposition of another set of surfaces thereof between said disks, and means for resiliently urging said disks toward one another to afford resilient surface treating abutment thereof with said surfaces of the object to be treated and whereby each disk serves as a backing for the surface treating operation of the other.

8. In a surface treating machine, a work holding assembly for securing a work piece in a rigid position while opposed surfaces thereof are being ground or the like, said work holding assembly including a shaft upon which said work piece may be rigidly mounted, said shaft being arranged to be pivoted into a substantially vertical position to afford application and removal of the work piece and being also arranged to be pivoted into a horizontal position whereby a set of opposed surfaces thereof are in position to be treated, means for rigidly locking said work piece

in said last named operative position and means for mounting the work holding assembly upon the machine in slidable relationship thereto, whereby another set of opposed surfaces may be aligned in position for treatment.

9. In an apparatus for treating the surface of bosses disposed on the forks of a bifurcated work piece, a pair of opposed surface treating disks and a source of power directly connected to each of said disks, each source of power and each disk being mounted for independent oscillatory movement toward and away from the work piece, means for supporting the work piece including plate members disposed on one side of the forks of said bifurcated element, said plate members being less than the thickness of the forks supported thereby to afford oscillation of the surface treating elements along the surfaces of said forks without obstructing said surface treating elements.

10. In an apparatus for treating the surface of bosses disposed on the forks of a bifurcated work piece, a pair of opposed surface treating disks and a source of power directly connected to each of said disks, each source of power and each disk being mounted for independent oscillatory movement toward and away from the work piece, means for supporting the work piece including plate members disposed on one side of the forks of said bifurcated element, said plate members being less than the thickness of the forks supported thereby to afford oscillation of the surface treating elements along the surfaces of said forks without obstructing said surface treating elements, said plate-like members being mounted for lateral movement to afford supports for work pieces having forks disposed in varying spaced relationship.

11. In a surface treating machine for treating opposed surfaces of an article, a pair of aligned driven shafts, surface treating tools disposed at the ends of the shafts, said tools being arranged in spaced, facing relationship, means for mounting said shafts and said tools for oscillatory movement into and out of working position, a work-holding assembly on said machine mounted to travel substantially parallel to said shafts, and means for moving said work-holding assembly to afford disposition of one set of opposed surfaces thereof in registration with the space between the tools and subsequent disposition of another set of surfaces thereof in registration with said space.

12. In a surface treating machine for treating opposed surfaces of an article, a pair of aligned driven shafts, surface treating tools disposed at the ends of the shafts, said tools being arranged in spaced, facing relationship, means for mounting said shafts and said tools for oscillatory movement into and out of working position, a work-holding assembly on said machine mounted to travel substantially parallel to said shafts, means for moving said work-holding assembly to afford disposition of one set of opposed surfaces thereof in registration with the space between the tools and subsequent disposition of another set of surfaces thereof in registration with said space, and means for resiliently urging said tools axially toward one another to afford resilient surface treating abutment thereof with the set of surfaces of the article to be treated and whereby each tool serves as a backing for the surface treating operation of the other tool.

13. In a surface treating machine for treating opposed surfaces of an article, a pair of aligned driven shafts, surface treating tools disposed at the ends of the shafts, said tools being arranged in spaced, facing relationship, means for mounting said shafts and said tools for oscillatory movement into and out of working position, a work-holding assembly on said machine mounted to travel substantially parallel to said shafts, means for moving said work-holding assembly to afford disposition of one set of opposed surfaces thereof in registration with the space between the tools and subsequent disposition of another set of surfaces thereof in registration with said space, and means for resiliently counterbalancing said shafts, tools, and mounting means to facilitate the oscillatory movement thereof.

14. In a surface treating machine, a pair of opposed surface treating members adapted to work on respectively opposite sides of a work piece disposed therebetween, a driven shaft and shaft supporting means for each of said members mounted for independent oscillation transversely of the shafts and also relative longitudinal movement thereof with the treating members, an overhead frame structure, and spring members suspended from said frame structure and connected to the respective shafts supporting means and acting to counter-balance the associated assembly of treating members, shaft and supporting means in the oscillation thereof, said spring members being biased toward one another to urge said assemblies longitudinally toward one another to carry the treating members against the respective sides of the work piece.

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