Sept. 2, 1930. G. F. BALLOU 1,774,584

PENCIL SHARPENER

Filed Sept. 20, 1927

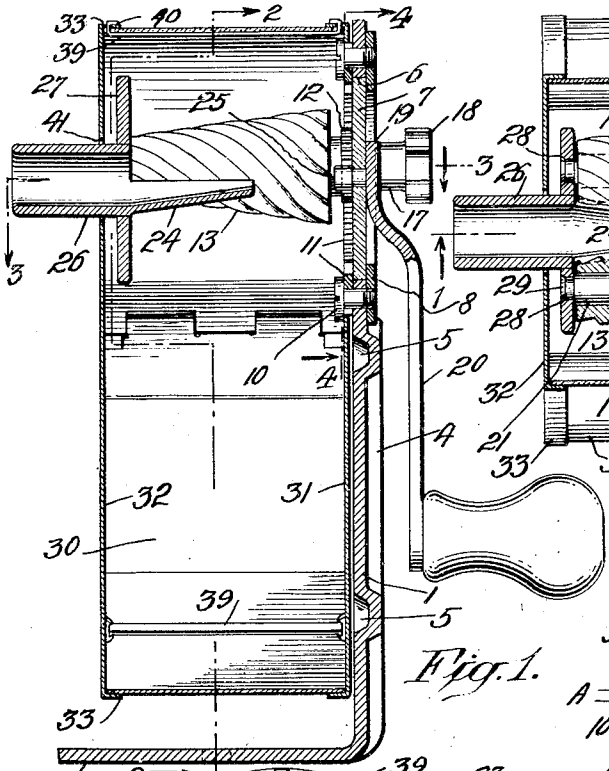


Fig. 1.

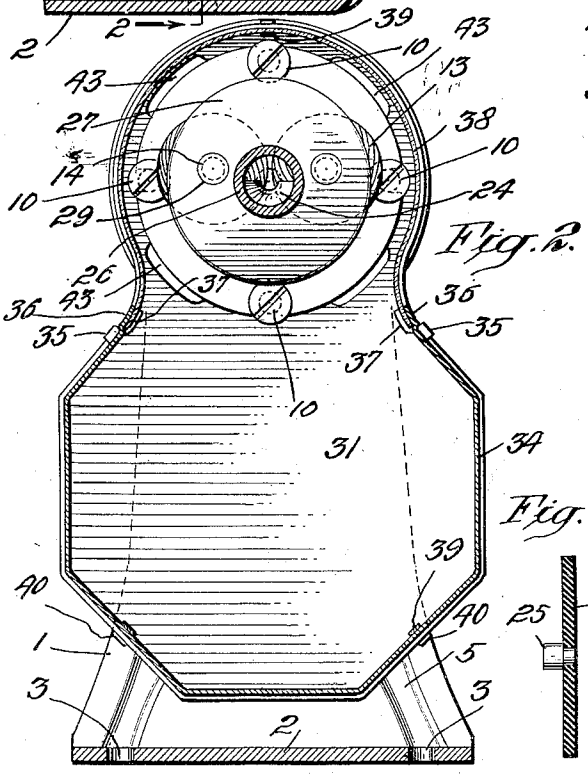


Fig. 2.

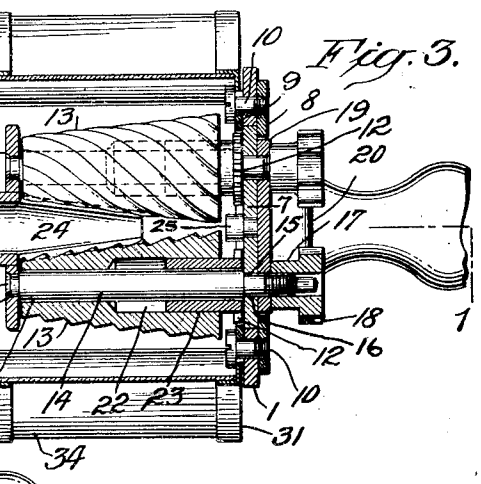


Fig. 3.

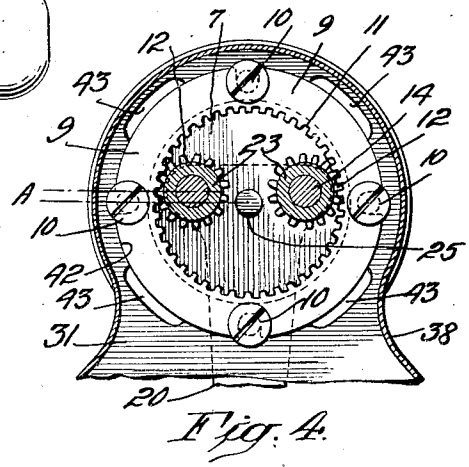


Fig. 4.

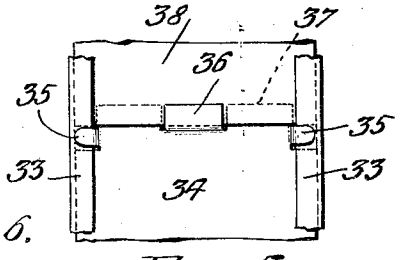


Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE

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PENCIL SHARPENER

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This invention relates more particularly to improvements in the rotary cutter type of pencil sharpeners, wherein a pair of rotary cutters are revolved bodily about the axis of the pencil, as the cutters are rotated, thereby to effect removal of the material of the pencil, so that it may be sharpened or pointed.

In well known pencil sharpeners on the market, cylindrical cutters are employed, the axes of which diverge so that the angle therebetween corresponds substantially to the angle to be given to the point of the pencil when it is sharpened. Furthermore, the cyindrical cutters in such sharpeners are diametrically or oppositely positioned, relative to the axis of the pencil or the axis of revolution of the cutters, so that if the wood of the pencil varies or the lead is not exactly central, an irregularly shaped point will result.

In other words, with the ordinary cylindrical cutters, diametrically placed, it is difficult, and sometimes impossible, to produce a uniform symmetrical point, and attempts on the part of the operator to remedy this defect, while sharpening a pencil, almost invariably results in breaking the point of the lead.

With the well known cylindrical cutter type of pencil sharpener, it is also known that the pencil is frequently used up or cut away too rapidly because the limiting stop or device for preventing the pencil from being pushed further and further into the sharpener after it has already received a sufficent point is too thin, like a knife edge, and allows the point to slip by between it and the cutter. This permits the point to become broken, or it may be necessary to withdraw and inspect the point a time or two in order to get it sharpened just right.

The primary object, therefore, of my present improvement has been to overcome these objections and produce an improved pencil sharpener which will produce a long tapering point, without breaking the lead, the wood of the pencil being sharpened or cut away concentrically of the axis of the pencil.

A further object of my improvement is to employ frusto-conical cutters adapted to be rotated on parallel axes, the axes of the cutters being off-set, relative to a diameter passing through the axis of the pencil and the axis of revolution of the cutters, and, further, to provide a guide member adapted to be revolved with the cutter and located concentrically of the axis of revolution and at right angles to a line between the axes of the cutters, the arrangement being such that the cutters and the guide form a three-point contact with the pencil during the pointing operation and the pencil is held in the crotch between the cutters.

A further object is to provide a stop or abutment in alignment with the axis of the pencil while being sharpened, said abutment being adapted to form a substantial stop for engaging the point of the pencil and limiting the inward movement thereof, thereby not only fully protecting the point, but preventing excessive cutting away of the wood of the pencil after a satisfactory point has been obtained.

Obviously, it is always desirable to reduce the cost of construction if this can be done without impairing the quality, therefore, in my improved construction, it is preferable to form the frame of the pencil sharpener out of sheet metal and mount the cutters on a rotating disc, the edge of which finds bearing support in an aperture in the sheet metal frame, the disc and frame plate being of substantially the same thickness.

A further object is to provide spur pinions for rotating the cutters, these pinions being mounted in the same plane and adapted to engage an internal gear, mounted in the plane of the pinions and preferably formed of an annular ring, which may be utilized, as in the present instance, to hold the revolving disc in the bearing aperture of the frame.

It is well known that with ordinary pencil sharpeners the cutters become dull after a time, and, since no provision is made for renewing the cutters, it is necessary, when the cutters become dull, to discard the machine and buy a complete new pencil sharpener. Therefore, a further object of my improvement is to provide a form of cutter which may be manufactured at a low cost and sold separately for the purpose of re-

newal. In order that the cutters may be readily renewed they are so mounted on the rotary disc, in my improved sharpener, that the pivotal supports therefor may be readily withdrawn to permit removing the cutters and replacing them with new cutters when so desired or required.

Pencil sharpeners of this type are adapted to be mounted in various positions, such as on the top of a shelf or table, or on a wall or even on the underside of a shelf or support; and, for this reason, the shavings receptacle of my improved pencil sharpener is so arranged in cooperation with the supporting frame, that it may be located or attached to the frame in any one of four positions at right angles to each other, thereby permitting the pencil sharpener to be attached to a wall or table or other support in any desired position.

One form of my improved pencil sharpener is shown in the accompanying drawings, in which Fig. 1 is a vertical sectional view of the pencil sharpener and its shavings receptacle on the line 1—1 of Fig. 3; Fig. 2 is a vertical cross sectional view on the irregular line 2—2 of Fig. 1; Fig. 3 is a top plan view partially in section, on the line 3—3 of Fig. 1; Fig. 4 is a broken away sectional view on the line 4—4 of Fig. 1; Fig. 5 is a detail side view, broken away, of the joint between the lower and upper parts of the shavings receptacle; and Fig. 6 is a vertical section of the rotary disc for supporting the cutters.

Referring to the drawings, the main frame 1 supporting the machine is preferably formed of sheet metal, the plate of metal being formed with an angular base portion 2 for supporting the sharpener and for attaching it to a wall, table or other support. Obviously, the pencil sharpener may be attached to a table, desk or other suitable support by an ordinary screw clamp or permanently secured thereto by means of screws through suitable holes 3 (see Fig. 2) in the base portion 2 of the frame. In order to stiffen the sheet metal frame, it is preferably stamped with vertical ribs 4 and transverse ribs 5, which preferably intersect and may be arranged in any suitable or preferred design, such as will ornament the frame.

The vertical portion of the frame plate 1 is preferably provided with a large opening or aperture 6 near the upper end thereof, forming a bearing for revolving the rotary cutters, and in which a disc 7 is rotatably mounted. The disc 7 is preferably held in position for rotation in the aperture 6 by means of thin annular rings 8 and 9, mounted on opposite faces of the frame plate 1, concentrically of the disc 7, and secured together and to the frame plate, by means of screws 10, which pass through suitable holes in the frame plate as shown in Figs. 1 and 3. The inner annular ring 9 (at left of frame in Fig. 1) is preferably provided with internal gear teeth 11, adapted to mesh with spur pinions 12, for rotating the respective cutters 13 when the latter are bodily revolved about the center of the disc 7, which coincides with the axis of the pencil being sharpened.

The cutters 13 are preferably frusto-conical, as shown in Figs. 1 and 3, and are pivotally supported on the disc 7, on rods or pivotal studs 14. The pivotal studs 14 are shown as reduced in size at 15 to form a shoulder for engaging the face of the disc 7, which is provided with suitable perforations 16, through which the reduced portions 15 of the pivotal studs may readily pass. Nuts 17 are provided for clamping and holding the pivotal studs 14 rigidly to the disc 7, these nuts being preferably provided with knurled heads 18, so that the studs may be readily removed in order to renew or replace the cutter when desired. In the present instance, the reduced portions 15 of the pivotal studs 14, after passing through the disc 7, pass through holes in the upper or shank end 19 of a handle crank 20, so that the clamping nuts 17 may serve the double purpose of holding the cutters mounted on the disc and for securing the handle thereto for rotating the disc.

As will be seen more particularly in Fig. 3, the frusto-conical cutters 13 are bored out at 21 to rotatably fit the pivotal studs 14 and are counterbored at 22, in the larger end of the cutter, for the insertion therein of the cylindrical hub 23, upon which the pinion 9 is preferably formed or mounted. In this arrangement, it will be seen that the bore in the hub 23 of the pinion 9 forms the bearing support for the large end of the cutter 13.

An important novel feature of my improvement is in off-setting the axes or centers of the cutters or mounting them so that, while the pinions 12 thereof are adapted to engage the internal gear 11, the axes of the pivotal studs 14 (and cutters 13) are not oppositely located on a diameter passing through the center of rotation of the disc 7. In other words, the radii from the centers of the respective pinions 12 through the center of rotation of the disc 7 intersect at an angle, that is, the two pivotal studs 14 are off-set a predetermined amount, such that a line between the axes of the two pivotal studs does not pass through the center of rotation of the disc 7. The amount of off-set in the present instance is represented by the distance between the two horizontal dotted lines A in Fig. 4.

This arrangement brings the centers of the cutters slightly closer together, than on a diameter, and, as the cutters are revolved about the axis of the pencil, the contacts thereof with the pencil, obviously, are not

diametrically opposite, but are on the same side of a diametral plane through the axis of revolution of the cutters. This produces two points of engagement on the same side of the center which, instead of reacting one against the other, tend to push the pencil to one side in a direction at right angles to a line between the pivotal centers of the cutters 13. In order to counteract this lateral thrust of the cutters against the pencil, a guide and counter-thrust member 24 is preferably positioned opposite the direction of off-set of the cutters, at right angles to a line between the centers thereof, and concentrically of the axis of rotation of the disc 7, substantially as shown in Fig. 1. The guide member or finger 24 is, as here shown, formed as a conic section, the axis of which coincides with the axis of rotation of the disc 7; and the apex of the inner face of the cone, of which the guide is a section, is substantially coincident with the front surface of the disc 7, or with a stop abutment 25 mounted centrally of the disc 7 and projecting to the left thereof, as shown in Figs. 1 and 6 of the drawings. The stop or abutment 25 is adapted to limit the inward movement of the pencil during the sharpening operation, thereby preventing excess cutting away of the pencil after it has been properly sharpened.

It will be seen that the guide member 24 provides for holding and, as it were, forcing the pencil into the crotch or groove between the conical cutters, so that the latter must sharpen the pencil absolutely concentrically of the axis thereof, that is, the guide acts as the third contact (with the two off-set cutters) of a three-point engagement of the pencil during the sharpening operation thereof. This enables the cutters to produce, at all times, a conical point on the pencil, which is substantially symmetrical with the body of the pencil.

The guide member or finger 24 may be of any suitable shape and may be supported, so as to rotate with the disc 7, in any preferred manner, but, in the present instance, it is formed as part of the tubular guide 26, through which the pencil is inserted during the sharpening operation, this tubular guide 26 being preferably provided with a flange 27, or suitable arms, provided with perforations at 28, in which the outer ends of the pivotal studs 14 are secured in any suitable manner, as by riveting over the ends thereof, as shown at 29, in Fig. 3. In this manner, it will be seen that the guide finger or member 24 is adapted to be revolved with the cutters about the pencil point during the sharpening operation, for, since the pivotal studs are secured to the disc 7, the guide member and cutters are likewise revoluble therewith, and secured thereto by the clamping nuts 17—18, as previously pointed out.

In order to provide for catching and holding the shavings or chips resulting from the sharpening operation, a shavings receptacle 30 is provided. This receptacle comprises two parallel sheet metal walls 31 and 32, which are preferably provided with turned-over laterally projecting flanges 33 adapted to support therebetween the peripheral wall of the receptacle or compartment. In the present instance, the lower periphery of the receptacle is shown as octagonal, although, of course, the shape is immaterial, and a thin sheet metal wall 34 is preferably mounted between the flanges 33 in the lower half of the receptacle, the upper lateral edges of the peripheral wall 34 being provided with off-set tongues 35, extending laterally to engage the flanges 33, as indicated in Figs. 2 and 5 of the drawings. The upper ends of the peripheral wall 34 are provided with off-set tongues 36 and 37, between which the ends of a celluloid or similar transparent peripheral wall member 38 is inserted, the latter being adapted to constitute the enclosure between the upper portions of the flanges 33, as more particularly seen in Fig. 2. The peripheral walls 34 and 38 of the receptacle 30 are held in place by transverse rods or connectors 39, three of which are shown in the present instance, one at the top and two at the bottom of the shavings receptacle, these links or connecting rods being preferably provided with tongues 40, which pass through slots in the flanges 33 and are bent over, as shown in Fig. 1, to thereby clamp the end plates 31 and 32 firmly together and, at the same time, support the peripheral walls 34 and 38 therebetween.

The outer wall 32 of the receptacle is provided with an opening at 41 for the passage therethrough of the pencil guide tube 26, while the other end wall 31 is provided with a large opening 42 (Fig. 4) preferably adapted to fit over the outer edge of the annular gear ring 9. In order to hold the shavings receptacle in place on the sharpener frame, the screws 10, as will be seen in Fig. 4, are preferably provided with large heads, which extend beyond the peripheral edge of the internal gear ring 9, and the edge of the opening 42 in the wall plate 31 is preferably provided with four notches 43, corresponding to the four screws 10. These notches are adapted to permit the receptacle to be mounted on the frame 1, by enabling the opening 41 in the plate 31 to be slipped over the heads of the screws, after which, by turning the receptacle to the position shown in Figs. 2 and 4, the heads of the screws 10 will engage the wall 31 between the notches 43 and thus hold the receptacle firmly in position. As previously indicated, my improved pencil sharpener may be mounted in any position, for by providing the four notches 43 and the four lugs or screw heads 10, the receptacle may be located in any one of four rectangular positions.

The operation of my improved pencil sharpener will be understood from the foregoing description; and it will be readily understood that the angle of taper of the point of the pencil may be determined according to the angle of the frusto-conical cutters. Preferably, in my sharpener, the cutters 13 are so shaped as to produce a long tapering point, which most people prefer, but which the ordinary pencil sharpener cannot safely produce. In my improved pencil sharpener, however, it will be understood that the guide 24 and the off-set cutters, giving the three point engagement of the pencil during the pointing operation, so steadies, guides and holds the pencil that the wood is cut away, always concentric with the axis of the pencil, and there is practically no possibility of the point being broken during the sharpening operation. Furthermore, by providing the stop abutment or stud 25 for engaging the point of the pencil and limiting its inward movement, continued and excessive sharpening or cutting away of the pencil is avoided and the operator is notified at once when the point is sharpened to its fullest extent.

An important feature of my improvement is the provision of frusto-conical cutters 13, which may be cheaply manufactured, and mounting them on the rotary bearing disc, so that they may be readily removed. This is accomplished by rotatably supporting the frusto-conical cutters 13 on the pivotal studs 14, which are secured to the rotatable disc 7 by knurled nuts 18, which enables the cutters to be replaced at any time that they may become dull. That is, by simply removing the nuts 17—18, the pivotal studs 14 may be withdrawn from the disc 7, the cutters removed and new cutters placed thereon, after which the studs are again secured to the disc 7. In my sharpener, this is such a simple operation that anyone can replace the cutters when required. The rotating cutter supporting disc 7 may be formed of metal or punched from sheet steel, in common with the handle 20; but, in use, the bearing is not likely to be oiled frequently and, therefore, it may be desirable or preferable to form the disc 7 of hard fiber, which will not require frequent oiling and will reduce friction.

While I have shown my improved pencil sharpener in the preferred form, it will be understood that I do not wish to be limited to the specific details of construction shown, for obviously, many of these may be modified, changed or rearranged to secure the same results, without departing from the spirit and scope of the invention.

I claim:—

1. A pencil sharpener comprising a pair of rotary cutters, mounted so as to be revolved about a center adapted to coincide with the axis of the pencil to be sharpened, the axes of rotation of said cutters being off-set relative to said center of revolution so that a line therebetween does not pass through the axis of the pencil, and guiding means located opposite the direction of said off-set for holding the pencil in the angle between the cutters.

2. A pencil sharpener comprising a pair of rotary cutters, means for revolving said cutters bodily about a center adapted to coincide with the axis of the pencil, the axes of rotation of said cutters being off-set so that a line therebetween does not pass through the axis of the pencil, and guiding means located opposite the direction of off-set for holding the pencil in the angle between the cutters while it is pushed into the sharpener.

3. A pencil sharpener comprising a pair of frusto-conical cutters, each provided with a spur pinion at the larger end thereof, an internal gear with which said pinions are adapted to cooperate, parallel pivotal studs upon which said cutters are mounted for rotation, a rotatable support carrying said studs and cutters for revolving them bodily about an axis coinciding with the axis of the pencil, said pivotal studs being displaced laterally relative to a diameter of said rotatable support, the displacement being such that a line between the axes of said studs does not pass through the axis of the pencil, and guiding means located opposite the direction of displacement of said cutters for holding the pencil in the angle between the cutters and in axial alignment with the axis of revolution of the cutters, the guide and cutters forming three points of contact with the pencil.

4. A pencil sharpener comprising a supporting frame, which is provided with a bearing opening, a rotatable disc mounted in said bearing opening, means for holding said disc in the bearing opening for rotation, an annular internal gear mounted on said frame concentrically of the axis of rotation of said disc, a pair of rotary cutters mounted for rotation on parallel pivotal studs projecting outwardly from said disc, pinions carried by said cutters and adapted to mesh with said internal gear, said pivotal studs being off-set relative to a diameter of said disc, so that a line between the centers of said studs does not pass through the center of rotation of said disc, and a guide member supported by said pivotal studs for holding the pencil in axial alignment with the axis of rotation of said disc, said pencil holding guide member being located opposite the direction of off-set of said cutters, that is at right angles to a line between the centers of said pivotal studs, the guide and cutters forming three points of contact with the pencil.

5. The pencil sharpener as claimed in claim 4, in which the outer ends of said pivotal studs are secured to and adapted to support a member provided with a tubular guide for the pencil and said guide is provided with an

off-set finger forming said guide member forming the third point of contact with and for holding and directing the pencil between the cutters and along the axis of rotation of said disc.

6. A pencil sharpener comprising a sheet metal frame, provided with a relatively large bearing aperture, a pair of rotary cutters, a disc supporting said cutters and mounted for rotation in said aperture, said disc being of substantially the same thickness as the sheet metal frame, annular sheet metal rings mounted on opposite faces of the frame in position to hold said disc for rotation in the aperture, and a sheet metal crank handle extending outwardly then radially of said disc for rotating the same.

7. The pencil sharpener as claimed in claim 6 in which the pair of rotary cutters is mounted on parallel pivotal studs secured to said disc, said cutters being frusto-conical and provided with spur pinions, at the ends thereof, and an internal gear mounted on said frame adapted to cooperate with said pinions for rotating the cutters when the disc is turned by said handle.

8. The pencil sharpener as claimed in claim 6, in which the pair of frusto-conical cutters is mounted on parallel pivot studs adapted to be secured to said disc, the line of centers between said pivotal studs being off-set relative to the axis of rotation of said disc and a guide member adapted to engage the pencil and hold it in axial alignment with the center of said rotatable disc.

9. A pencil sharpener comprising a sheet metal frame, stamped with stiffening ribs and provided with a bearing aperture, a pair of rotary cutters with spur pinions, a rotatable disc supporting said cutters and mounted in said bearing aperture, said disc being of substantially the same thickness as the sheet metal frame, annular sheet metal rings removably secured on opposite faces of said frame for cooperation with opposite faces of said rotatable disc for holding the same for rotation in the plane of said frame, one of said annular rings being provided with internal gear teeth for engaging said pinions and rotating the cutters and screws for securing said rings to the frame concentric with said disc.

10. The pencil sharpener as claimed in claim 9, in which said rotatable disc is provided with perforations for removably supporting a pair of parallel pivotal studs, upon which the rotary cutters are mounted and nuts for removably securing said studs to said rotatable disc, thereby permitting the cutters to be removed.

11. The pencil sharpener as claimed in claim 9, in which a pair of pivotal studs for supporting the rotary cutters is mounted on said disc and adapted to project outward parallel to the axis of rotation thereof, the studs being off-set so that a line between their axes does not pass through the axis of rotation of the disc, the outer ends of said pivotal studs being secured to a tubular guide member provided with an angularly disposed guide finger, the angle of which corresponds substantially to the angle to be given to the point of the pencil in sharpening the same, the axis of said guide being in axial alignment with the center of rotation of said disc.

12. A pencil sharpener comprising a rotatable disc provided with perforations, a crank handle for rotating said disc provided with perforations corresponding to the perforations in said disc, a pair of cutters provided with spur pinions for rotating the same, an internal gear parallel to and concentric with said rotatable disc for engaging said pinions, a pair of parallel pivotal studs for rotatably supporting said cutters, the ends of said pivotal studs being threaded and adapted to pass through the perforations in said disc and handle, and nuts for the threaded ends of said studs for clamping the studs and the handle to said rotatable disc for rotation of the cutters by said handle.

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