

Sept. 11, 1945.

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2,384,512

MACHINE PROTECTIVE APPARATUS

Filed Jan. 5, 1944

2 Sheets-Sheet 1

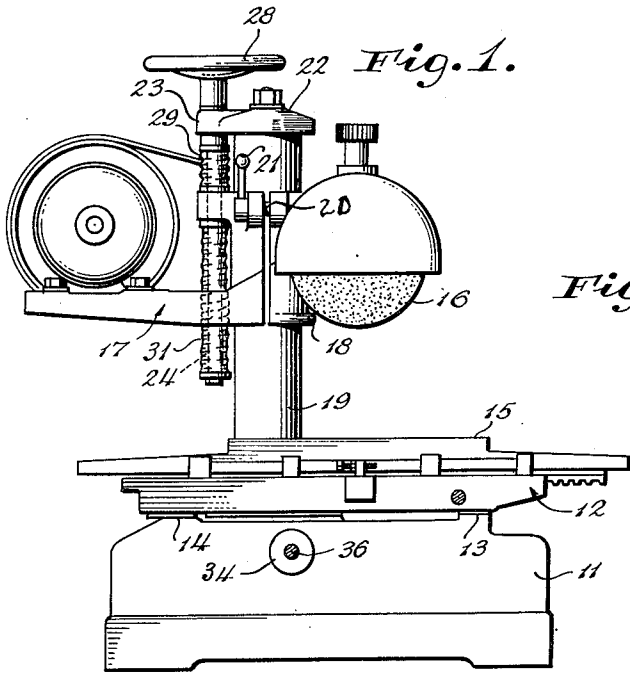


Fig. 1.

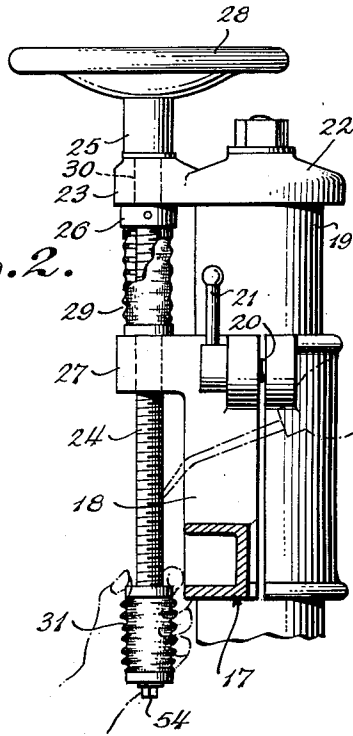


Fig. 2.

Fig. 4.

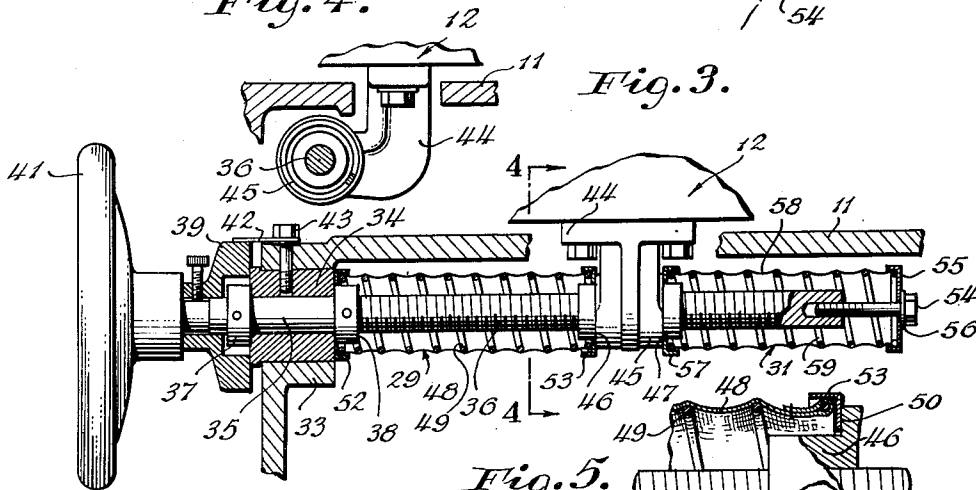
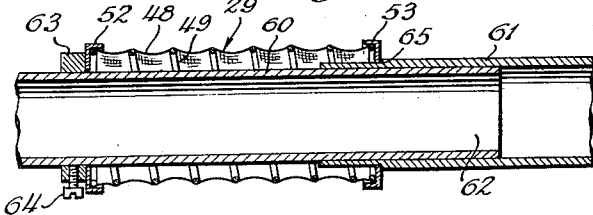


Fig. 3.

Fig. 5.

Fig. 6.



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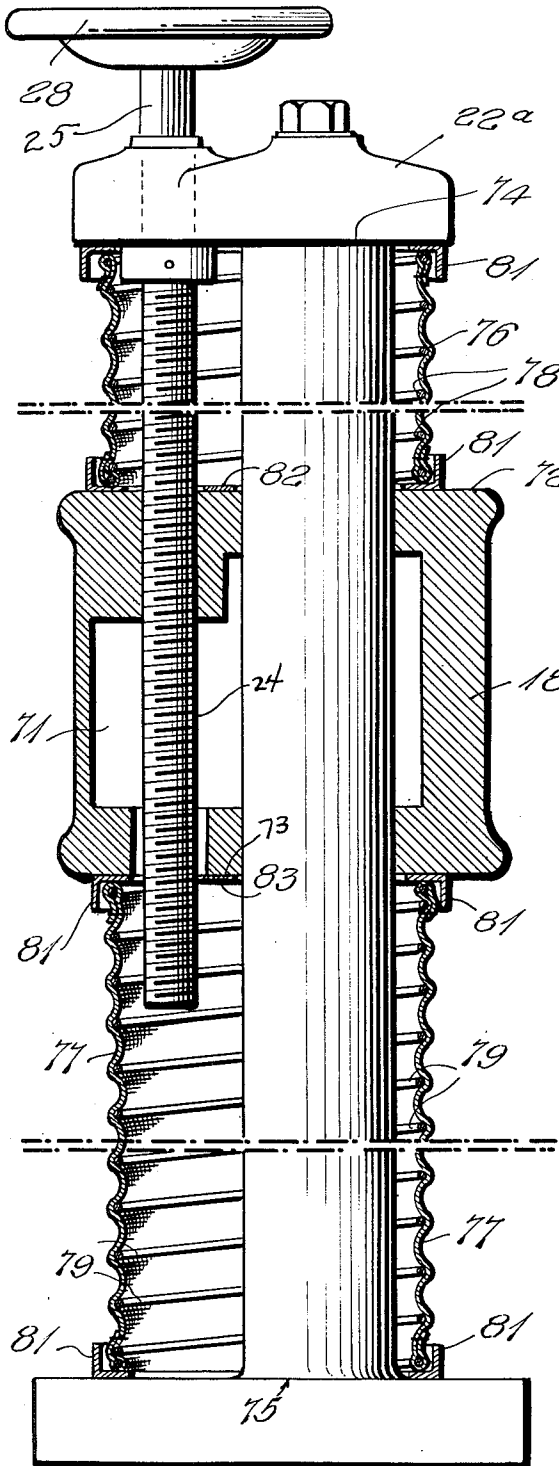


Fig. 7

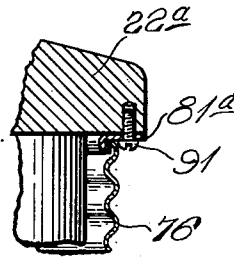


Fig. 8

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# UNITED STATES PATENT OFFICE

2,384,512

## MACHINE PROTECTIVE APPARATUS

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Application January 5, 1944, Serial No. 517,150

2 Claims. (Cl. 51—268)

This invention relates to protective coverings and is particularly concerned with expansible and contractible protective coverings capable of enclosing surfaces, machine parts and the like of variable extent.

Machine parts such as feed screws, slide guide surfaces and the like that usually have exposed lubricated areas collect considerable foreign matter such as abrasive dust and dirt which causes wear and otherwise interferes with efficient operation. The invention has special application for the protective covering of such parts during all working conditions without interfering with normal operation or preventing lubrication and other normal treatments of such parts.

It is a major object of the invention to provide novel extensible and contractible covering arrangements for machine surfaces and parts and the like of variable extent.

A further object of the invention is to provide novel arrangements for preventing the intrusion of dirt, dust, moisture and the like to guide, bearing and like surfaces of variable extent without interfering with normal functioning of such surfaces.

It is a further object of the invention to provide a novel tubular protective casing which is longitudinally or axially flexible but sufficiently strong to substantially support itself against longitudinal bending even when fully extended, and which maintains a substantially uniform inner diameter during all conditions of expansion and compression.

It is a further object of the invention to provide a novel expansible and collapsible covering adapted to extend over parts normally exposed to variable extent by relative displacement of two members regardless of the relative disposition of said members.

It is a further object of the invention to provide a novel expansible and collapsible casing adapted to be supported at opposite ends by relatively adjustable members for extending over parts between said members without interfering with normal operation thereof.

A further object of the invention is to provide a novel hollow protective covering wherein a sleeve of fabric or the like is mounted on a longitudinally expansible and contractible open-ended supporting form.

It is a further object of the invention to provide a novel protective covering wherein a sleeve of fabric or the like is mounted on a substantially cylindrical spring form.

A further object of the invention is to provide

novel protective covering means for a feed screw which is extensible and contractible with corresponding adjustment of said screw without interfering with such adjustment.

5 Further objects of the invention will presently appear as the description proceeds in connection with the appended claims and the annexed drawings wherein:

10 Figure 1 is an elevation somewhat diagrammatically illustrating the invention as applied to a vertical feed screw of a grinding machine;

15 Figure 2 is an enlarged elevation partly in section illustrating chiefly that a protective feed screw covering of the invention may be readily collapsed for oiling and like operations;

20 Figure 3 is an enlarged side elevation, mainly in section, illustrating details of protective coverings according to a preferred embodiment of the invention as used on a horizontal feed screw in the machine of Figure 1;

25 Figure 4 is a fragmentary view partly in section taken along line 4—4 of Figure 3 illustrating attachment of the horizontal feed screw to the table shifted thereby;

30 Figure 5 is an enlarged elevation, partly in section, illustrating details of construction of a protective covering of Figure 3 at one end; Figure 6 is a rather diagrammatic elevation, partly in section, illustrating the invention as applied to telescoping members, Figure 7 shows further a modification and Figure 8 is a fragmentary vertical section through another modified form of the invention.

35 Figure 1 illustrates a surface grinding machine having a base 11 on which a table assembly indicated at 12 is slidably supported, as by suitable guides at 13 and 14, for movement in a plane normal to the plane of the paper. This movement is accomplished by the horizontal feed screw assembly further illustrated in Figure 3, as will appear.

40 Table assembly 12 is provided with a work surface 15 for supporting work to be engaged by a grinding wheel 16 suitably mounted and driven in a grinder assembly 17 wholly carried by a split collar 18 which is slidably adjustable along a cylindrical vertical column 19 rigidly upstanding from base 11. Collar 18 is formed with aligned lugs in which is threaded a screw 20 rotatable by handle 21. By manipulation of handle 21, to turn screw 20, collar 18 may be expanded and loosed for vertical adjustment along column 19, and collar 18 may be drawn tight and locked in any desired position on column 19.

45 50 55 A cap 22, rigid with the top of column 19, has

an integral ear 23 in which is journaled the cylindrical shank 30 of a vertical lift feed screw 24, as illustrated in Figure 2. Enlarged rigid collars or formations 25, 26 on screw 24 prevent axial displacement of screw 24, which is threaded into an ear 27 rigid with collar 18. After handle 21 has been turned to release collar 18, the latter may then be vertically displaced by rotation of handle 28 of feed screw 24 to raise or lower grinding wheel 16 as desired with respect to work surface 15.

The above described grinder apparatus is disclosed and claimed in our copending application Serial No. 467,512 filed December 1, 1942, to which reference is made for any further detail.

According to one phase of the invention the threads of feed screw 24 are protectively enclosed by flexible extensible and collapsible tubular casings 29 and 31 during all conditions of adjustment of screw 24.

As illustrated in Figure 2, flexible casing 29 extends under compression between ears 23 and 27 and is longitudinally or axially resilient so that its lower end may follow ear 27 during all vertical adjustments. Similarly, flexible casing 31 extends under compression between ear 27 and a suitable support rigid with the end of screw 24 and is longitudinally resilient so that its upper end may also follow ear 27 during all vertical adjustments.

Flexible casings 29 and 31 are like Sylphons, and will probably present exteriors which are more wrinkled than illustrated in Figure 2 when compressed by adjustment of feed screw 24 or by the operator's hand to permit oiling of the threads as illustrated, but it will be appreciated that the drawings are illustrative only and both casings are of sufficient longitudinal extent to cover the feed screw threads in both extremes of vertical adjustment. The same applies to Figure 3 described below.

Casings 29 and 31 may also be employed as protective coverings for the horizontal feed screw as illustrated in Figure 3. Since Figures 3 and 5 illustrate casings 29 and 31 in considerable detail, description of the latter will now proceed in connection with Figures 3-5.

The front wall of base 11 is formed with a hollow boss 33 for receiving a support collar 34 in which is journaled the cylindrical shank 35 of a horizontal feed screw 36. Axial displacement of screw 36 is prevented by suitable enlarged stop members 37, 38 pinned or otherwise made rigid therewith. Outside base 11, shank 35 has secured thereto a graduated disc 39 and a hand wheel 41. An index 42 for cooperation with disc 39 is secured to base 11 by a machine screw 43 which also holds collar 34 immovable in boss 33.

A bracket 44, bolted to the underside of table assembly 12, extends downward through a suitable slot in base 11 and is formed with a boss 45 into and through which screw 36 is threaded. When wheel 42 is rotated, table assembly 12 is displaced. The above briefly described construction and operation of the apparatus of Figures 3 and 4 is also disclosed in said Serial No. 467,512 to which reference is also made for further detail if needed.

Boss 45 is formed with reduced cylindrical end shoulders 46, 47 which provide substantially vertical reacting surfaces for casings 29 and 31 as mounted on feed screw 36.

Casing 29 extends between opposed substantially vertical faces on the inner end of collar 34 and on shoulder 46, respectively. Casing 29

comprises a tubular sleeve 48 of some dust and moisture proof fabric such as heavy canvas and surrounds an axially expansible contractible hollow supporting form such as a cylindrical fine wire coil spring 49. As illustrated in Figure 5, each end of sleeve 48 is turned over the end coil of spring 49 and secured thereto as by stitching 51. The length of sleeve 48 is chosen so as to be at least slightly greater than required for extreme outward adjustment of boss 45, and spring 49 is of such length as to be under considerable compression even in such extreme adjustment position.

The opposite ends of casing 29 are nested within substantially cup-shaped annular sheet metal retainers 52 and 53 which are maintained tight against the opposed vertical faces of collar 34 and shoulder 46 by the compression of spring 49. Referring to Figure 5, it is seen that spring 49 maintains retainer 53 flat and tight against face 50, and retainer 52 is similarly maintained flat and tight against collar 34.

When hand wheel 41 is rotated, feed screw 36 rotates without interference from casing 29 since the form afforded by spring 49 maintains substantially uniform internal diameter for the casing and thus maintains the fabric sleeve well away from the screw threads. As boss 45 is displaced by such rotation, retainer 53 and the end of casing 29 follow because of the expansion of compression spring 49. When boss 45 has been adjusted to its furthest position from collar 34, spring 49 is still under sufficient compression to maintain retainers 52 and 53 tight against collar 34 and face 50.

If desired, retainers 52 and 53 could be made for press-fitting with stop 38 and shoulder 46, but this is not needed if spring 49 is sufficiently strong. The main functions of stop 38 and the cylindrical face of shoulder 46, so far as casing 29 is concerned, are to prevent accidental radial displacement of retainers 52, 53 into engagement with the screw threads. However, especially for vertical feed screws such as in Figure 2, such cylindrical shoulder faces may be eliminated if desired, since the retainers need be urged against axially facing surfaces only.

The free end of screw 36 is formed with a tapped bore in which is threaded a bolt 54. The shank of bolt 54 projects a considerable distance from the end of screw 36 freely through a suitable aperture in a cup-shaped sheet metal retainer 55. Retainer 55 is partly supported by bolt 54 which is rotatable relative thereto. A suitable flat washer 56 is interposed between the head of bolt 54 and retainer 55 for providing added slippage between them.

Casing 31 surrounding screw 36 has its opposite ends nested within retainer 55 and a retainer 57 seated against the vertical face of shoulder 47. Casing 31 comprises a sleeve 58, similar to sleeve 48, surrounding a cylindrical compression spring form 59 similar to spring 49. The lengths of sleeve 58 and spring 59 are chosen as above explained in connection with casing 29. Casing 31 is thus maintained under longitudinal compression substantially between boss 45 and screw 36.

When screw 36 is rotated, the opposite ends of casing 31 are simultaneously axially displaced in opposite directions. Retainer 57 is maintained tight against shoulder 47 during such rotation of screw 36, but there must be relative rotation between bolt 54 and retainer 55 to prevent undesirable turning of casing 31. This is accomplished by selecting a compression spring 59 which is

sufficiently strong longitudinally that bolt 54 rotates freely relative to retainer 55 when screw 36 is rotated. This desirable result can be obtained by suitably proportioning the parts, and retainer 55 is thereby maintained against rotation to keep casing 31 from undesirable turning and twisting.

Similarly to casing 29, casing 31 extends over the end threads of screw 36 during all adjustments. The projecting length of bolt 54 beyond the end of screw 36 is selected to accommodate collapsed casing 31 when screw 24 is adjusted to its extreme to the left.

Casing 31, in Figure 2, has its lower end connected to the end of screw 24 in the same manner as it is connected to the end of screw 36 in Figure 3.

With no protective casings on screw 36, the latter may be pulled out through boss 33 by turning screw 36 until it clears boss 45, after removing screw 43.

For assembling casings 29 and 31 on screw 36, the latter is inserted through boss 33 until its free end is about halfway between collar 34 and boss 45. Then retainer 52, casing 29, retainer 53 and boss 45 are positioned as in Figure 3, and screw 36 rotated until it threads into and extends through boss 45. At this time, retainer 57 and casing 31 are passed over the end of the screw and retainer 55 with bolt 54 in position is placed on the free end of casing 31 and pushed inwardly until bolt 54 can be secured to the end of screw 36. In each instance, before casing 29 or 31 is assembled over the screw, the screw threads are greased very liberally. The reverse operation takes place when it is desired to remove the casings.

Casings 29 and 31 when assembled for use as in Figures 2, 3 and 6 are substantially self supporting longitudinally by reason of their compression. In fact, even when removed from the machine assembly and permitted to fully expand, casings 29 and 31 substantially support themselves against longitudinal bending. Casings 29 and 31 also maintain substantially a fixed internal diameter regardless of compression and expansion, to prevent contact with the threads protectively enclosed thereby.

Figure 6 illustrates application of the invention to protection of the normally exposed slide guide surface 60 between two relatively axially slidable telescoping tubes 61 and 62. Here casing 29 extends under compression between a flat face on a collar 63, secured to tube 62 as by set screw 64, and an opposed parallel flat shoulder face at 65 on tube 61.

In Figure 7 we have shown a further modification of the invention in which the grinder of Figures 1 and 2 is provided with a pair of boots which protect both the raising and lowering screw 24 and the column 19. In this instance collar 18a is of modified form, being of sufficient size to provide a chamber 71 for the lower end of the lifting screw and has annular top and bottom faces 72 and 73, respectively. Cap 22a is similarly enlarged to provide an annular, downwardly directed face 74. Machine base 11 is also provided with an upwardly directed face 75.

Telescoped over the column, above and below collar 18a, and enclosing the exposed portions of both the column and lifting screw, are a pair of expansible and contractible boots 76 and 77, respectively, having expanding springs 78 and 79. Each boot has a pair of retainers, or end sealing caps 81. The retainers of boot 76 seat

against surfaces 72 and 74 of collar 18a and cap 22a, respectively, and the retainers of boot 77 seat against faces 73 and 75 of the collar and base, respectively, to seal the boots against ingress of dust or other extraneous material, in a manner similar to the forms of boot previously described, it being understood that the boots may be slid back for inspection or oiling against the action of their springs. The retainers seating against the collar are provided with enlarged apertured portions 82 and 83 through which screw 24 projects.

It is accordingly apparent that by using a pair of comparatively large diameter boots both the column and lifting screw are adequately guarded, and it is to be understood that it is not absolutely essential to employ boots of cylindrical form. For instance, where the parts to be guarded are of asymmetrical shape, and it is desired to make the boot assembly as compact as possible, it may be given a configuration approximating that of the parts to which it is applied, provided that the departure from cylindrical form is not so great as to impair the action of the expander spring or to otherwise adversely affect the sealing action of the boot.

In all of the above described embodiments of the invention, the flexible tubular casings are longitudinally compressed substantially between relatively movable members, and the casings expand or collapse with relative movement of the members so as to maintain their protective covering without interfering with normal operation of the members. The casings are under such strong axial compression, even during extreme separation of the members, that they are dust and dirt tight. If desired, the retainers could be secured to the ends of the casings to facilitate assembly. The relative sizes of the members is also immaterial to the invention.

In some instances, especially where, as illustrated in Figures 1, 2 and 7, the element or elements to be guarded are substantially vertical, the spring may be omitted and gravity forces relied upon to cause the boot to hang out of contact with the guarded element in response to the relative movement of the two members with which the boot is associated. Such a device is shown in Figure 8 and comprises a ring or plate 81a suitably sewed onto each end of boot 76, the upper ring or plate being secured as by screws 91 or other suitable means adjacent the upper part of the column or other member to be guarded, and the lower ring or plate being left free so as to gravitationally rest on the upwardly facing surface with which it cooperates. In this form of the invention the material of the boot may be allowed to fall in random folds as the parts to be guarded are moved toward each other or, if desired, fold lines or corrugations may be formed in the material beforehand, so as to insure folding of the boot in a predetermined manner during operation. Lubrication or inspection of the column or other member may readily be effected by grasping the free member 81a and collapsing the boot in the manner heretofore described.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come

within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In combination with a shiftable member and a rotatable feed screw threadedly connected thereto and projecting from opposite sides thereof, longitudinally flexible tubular casing means surrounding the exposed threads of said screw, said casing being expansible and contractible so as to be automatically maintained axially co-extensive with said screw during all conditions of operation, and said casing means maintaining substantially uniform inner diameter during said conditions so as to avoid engagement with said feed screw threads.

2. A device for protectively enclosing normally exposed threads of a rotatable feed screw threadedly connected to a member to be moved thereby and having a free end projecting beyond said member comprising a retainer rotatably mounted at said free end of said feed screw, an axially flexible hollow casing surrounding said feed screw and seated at opposite ends on said member and said retainer so as to provide a covering for the threads of said feed screw beyond said member regardless of the position of said member, said retainer preventing rotation or twisting of said covering when said feed screw is rotated.

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