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[31] **K61,593X**

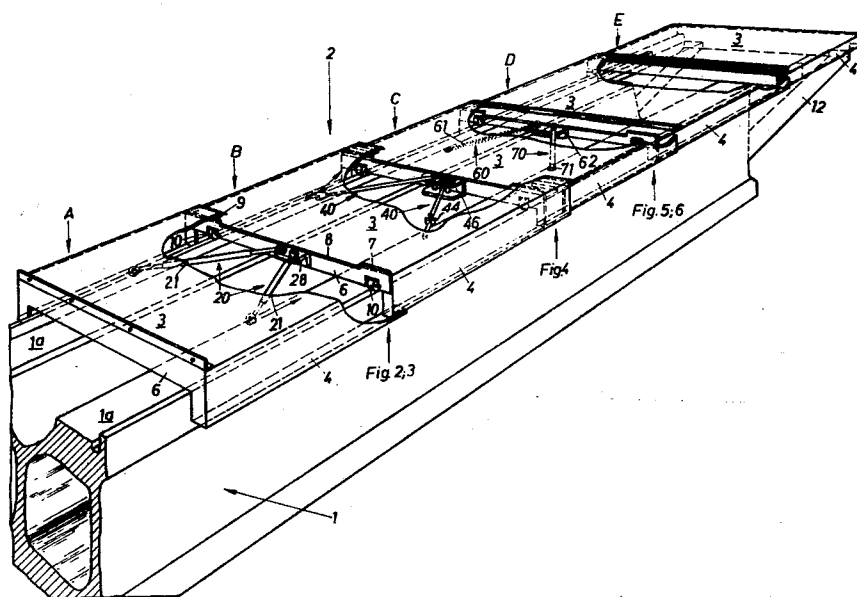
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[54] **PROTECTIVE COVER FOR GUIDE PATHS OF MACHINE TOOLS**
13 Claims, 14 Drawing Figs.

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160/222
[51] Int. Cl..... **E05d 15/06;**
E06b 03/46
[50] **Field of Search**..... **160/143,**
144, 152, 145, 191, 193, 197, 202, 221, 222, 223,
224, 84 (LTH), 84 (LTV); 308/3.5;
74/(Inquired); 267/69, 73, 74, (Inquired); 49/379;
16/71—77

ABSTRACT: A protective cover for guide paths of machine tools, which comprises a plurality of overlapping cover sheets movable into each other telescopically, and running rollers and slide members, respectively. Each of the cover sheets are supported at the forward end wall with running rollers and slide members, respectively, on the guide path and at the rear end on the next smaller of the cover sheets. A plurality of energy accumulators produce return movement forces during movement out and movement in of the cover sheets from a center position, and are disposed between the cover sheets, and the return movement force is equal to zero in the center position and is greatest in the respective end positions upon moving-out and moving-in, respectively, of the cover sheets.



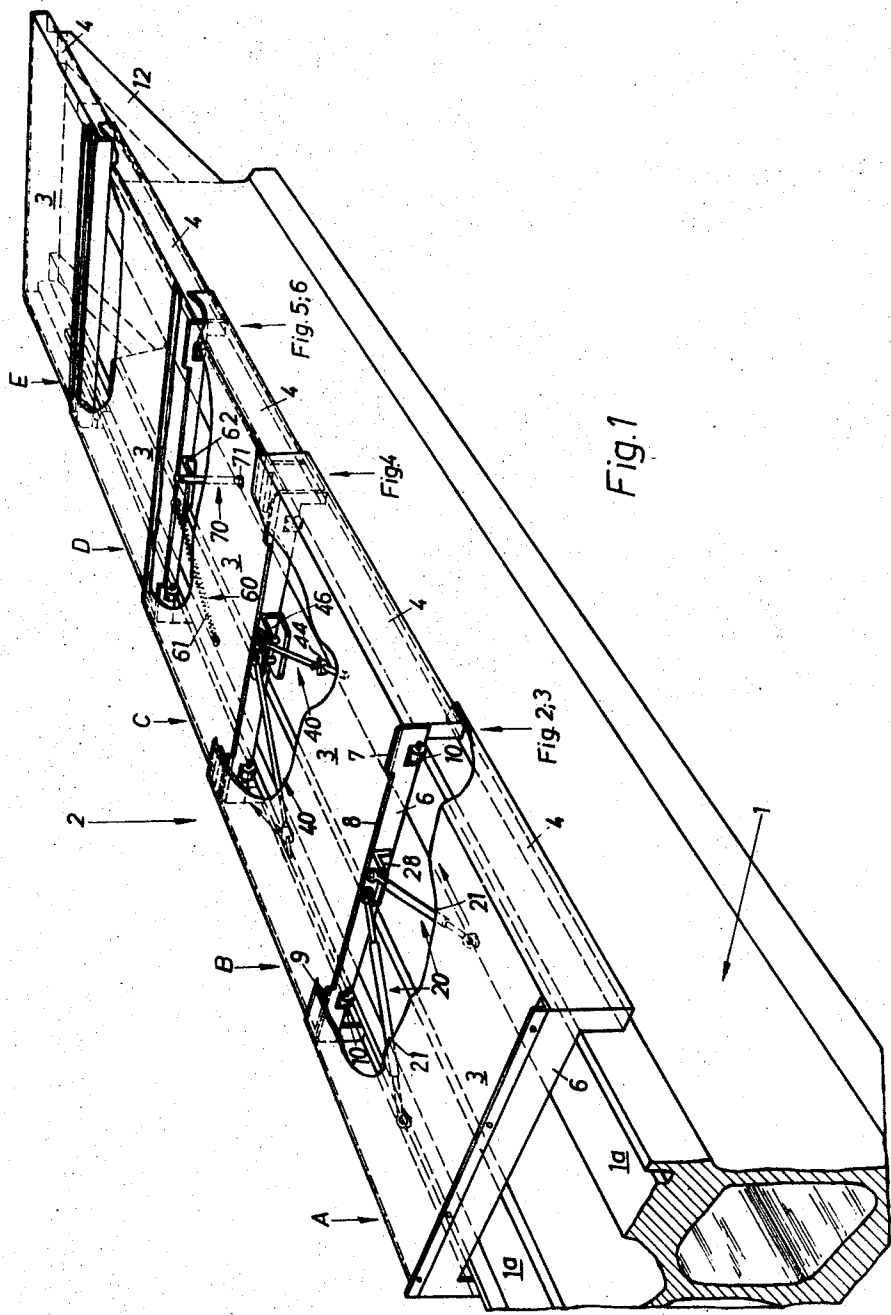
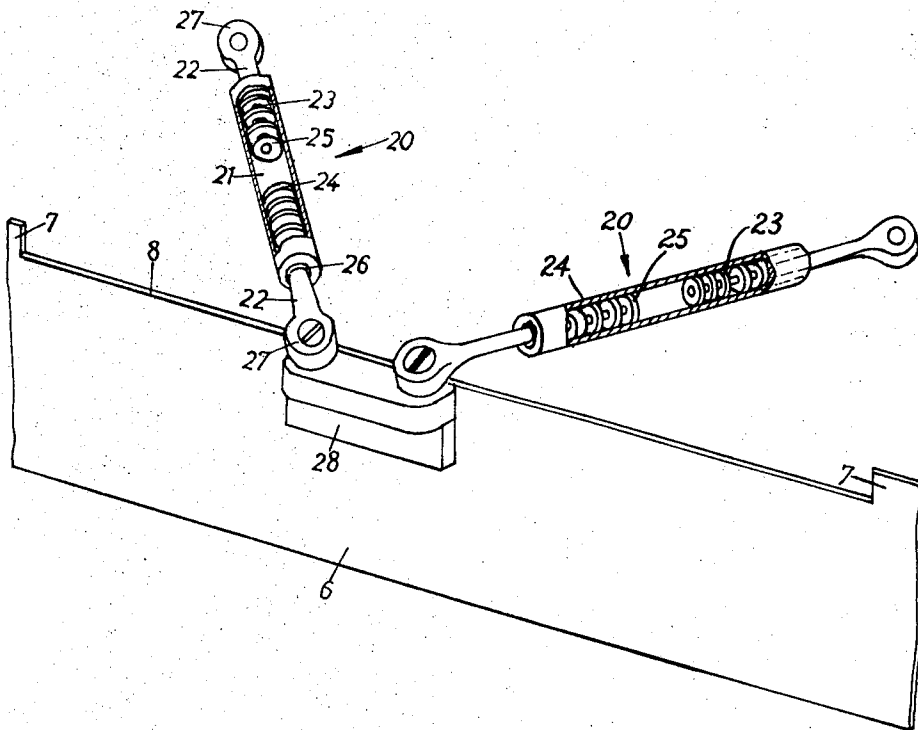


Fig. 1

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Fig. 2



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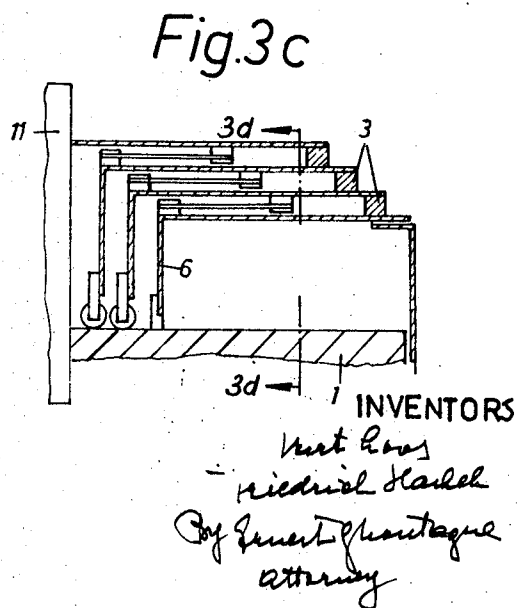
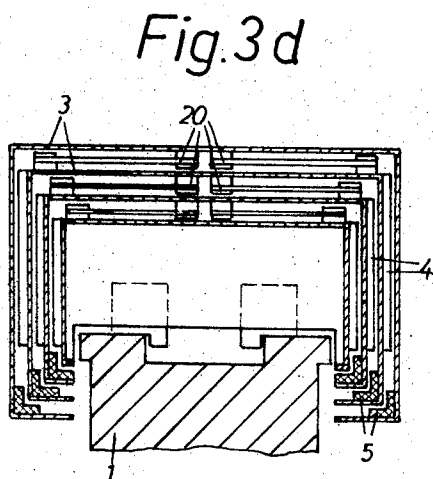
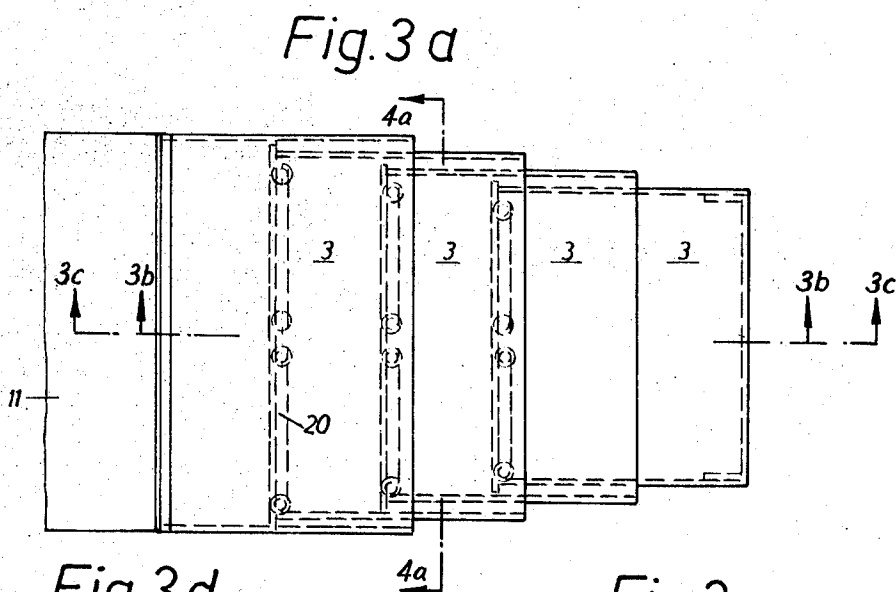
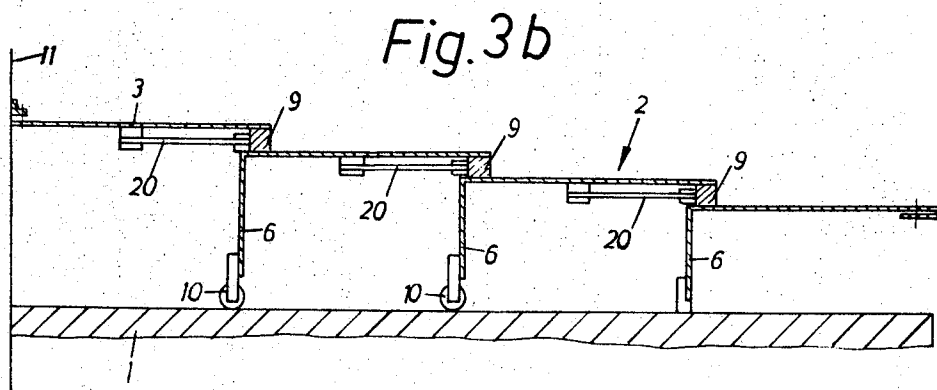


Fig. 4a

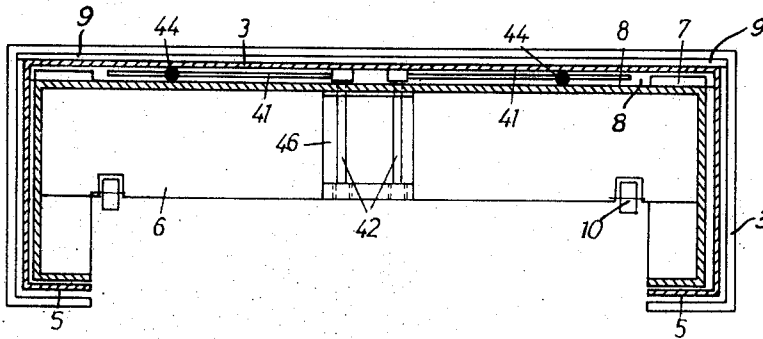
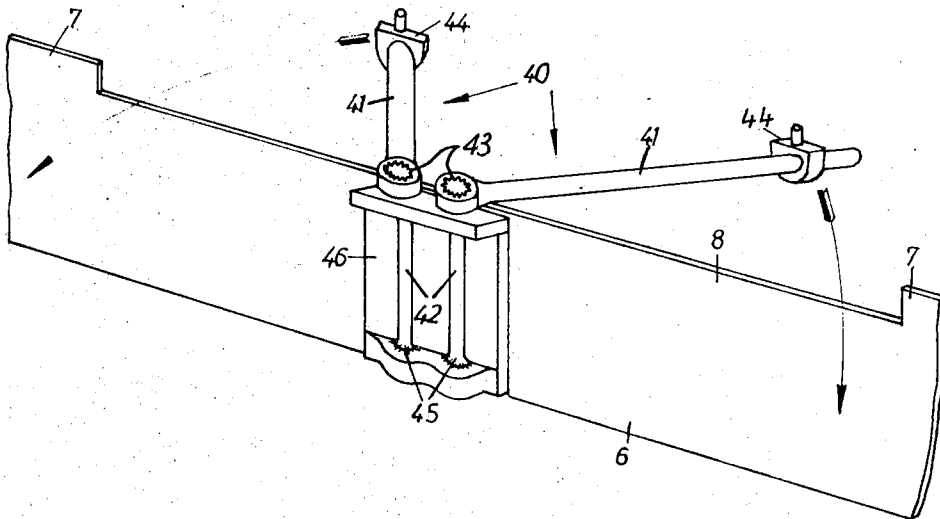


Fig. 4b



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Fig. 6b

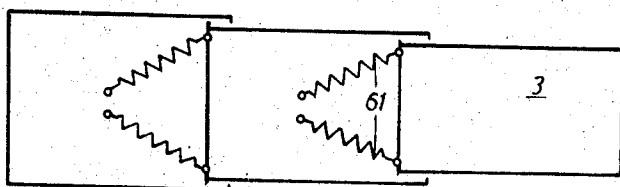


Fig. 6c

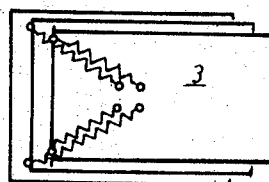


Fig. 6a

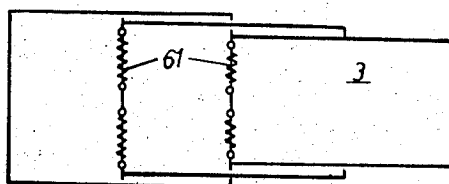


Fig. 5b

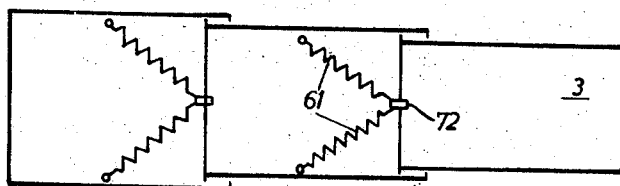


Fig. 5c

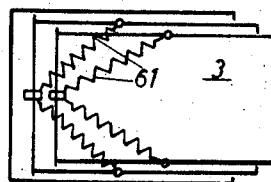
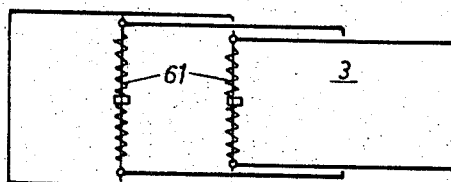


Fig. 5a



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PROTECTIVE COVER FOR GUIDE PATHS OF MACHINE TOOLS

The present invention relates to a protective cover for guide paths for machine tools, in general, and to such protective cover which comprises a plurality of overlapping telescopically moving cover sheets, whereby each of the cover sheets is supported at its front end with running rollers, slide members or the like on the guide path and at the rear end on the next smaller cover sheet, in particular.

Protective covers of this type with cover sheets telescopically movable into each other are known in different embodiments. The telescopiclike, uniform movement of all cover sheets during moving from each other and moving towards each other, respectively, of the protective cover, is caused by means of a shear guide, whereby the front end of the shears is pivotally secured to the part reciprocating on the guide path of the machine tool, for instance, a support, and the other end of the shears is secured at the end of the guide path and the cover sheets are pivotally connected to the crossing points of the shear members. These known shear guides has the disadvantage or drawback that the total pulling force and shearing force, respectively, required for the process of the protective cover must be supplied by the drive of the support. For this reason in the known protective cover with shear guide no great moving speeds are possible.

It is one object of the present invention to provide a protective cover for guide paths of machine tools for great moving speeds of the order of 100 m/min., in which the pulling and shearing forces required for the operation are very low and do not have to be taken any more solely from the drive of the support.

It is another object of the present invention to provide a protective cover for guide paths of machine tools, which avoids the drawbacks of the known structures.

Starting with the known protective cover for guide paths of machine tools which comprises a plurality of overlapping and telescopically moving cover sheets, whereby each cover sheet is supported at its front end with running rollers, slide members or the like on the guide path and at the rear end of the next smaller cover sheet, the object aimed at by the present invention is obtained by accumulators disposed between the cover sheets and producing during the movement from each other and towards each other, respectively, from a center position return setting forces, whereby the return setting force in the center position is equal to zero and is the largest in the end positions reached after moving the cover sheets from each other or together, respectively.

The protective cover formed in accordance with the present invention has the advantage, that while it releases to a great extent the drive, because the energy accumulators release acceleration energy during moving together from the pulled-out end position and by pulling out from the other end position into a center position. The protective cover formed in accordance with the present invention is elastic, as a rubber band and has always the tendency to contract and move apart, respectively, to half of its length. In view of this effect the protective cover formed in accordance with the present invention can be moved in its center range, which is mostly used nearly without any inertia. A further advantage resides in the fact, that for moving out from each other and moving together, respectively, of the total protective cover into an end position always only the pretension force of the energy accumulator inserted between two cover sheets must be overcome, because all energy accumulators are disposed in series.

In a preferred embodiment, two equal energy accumulators are disposed at an angle relative to each other between individual cover sheets and, on the one hand, are pivotally connected at about the center below the upper cover sheet and, on the other hand, on the end wall of the lower cover sheet.

In order to make possible that the energy accumulators can oscillate about their pivot point on the end walls of the lower cover sheet, it is suitable to provide each end wall within the range of the movement path of the energy accumulator with a

recess. Furthermore, it has been found suitable to connect pivotally the energy accumulators disposed at an angle towards each other at the end wall of the cover sheet closely to each other on a joint console secured below the recess at the end wall, while the pivot points at the other end are further removed from each other, so that a V-shaped arrangement is produced which points in the direction towards the end wall.

The energy accumulators can in preferred embodiments comprise a pneumatic or hydraulic cylinder, the piston rods of which are equipped with eyes and pivotally connected below the other sheet on the one hand, and on the console, on the other hand. In the pneumatic version, the vacuum can be produced between the two pistons upon pulling out the piston rods. In the hydraulic version the pistons are equipped suitably with throttle valves.

In a further preferred embodiment, the energy accumulators comprise a guide tube with an inserted pressure spring, or a plurality of inserted blade springs and a pressure rod inserted from both sides, with which are pivotally connected by means of eyes below the cover sheet and on the console, respectively. This embodiment has the advantage, in comparison with the pneumatic or hydraulic version, that no sealing problems have to be solved.

In a further embodiment, the energy accumulators can comprise also a rotary rod pivotally connected below the cover sheet with a rotary rod spring disposed on the console. The rotary rod is thereby suitable longitudinally displaceable in guide eyes rotation-free mounted below the cover sheet, while the rotary rod spring is mounted at the lower end safe against rotation with a serration at the upper end mounted rotary-free in the console. In order that the cover sheets are displaced absolutely parallel to each other in this embodiment of the energy accumulators, the guide eyes can be equipped with toothed segments which mesh each other. In an equivalent embodiment, the energy accumulators comprise a lever rod with a spiral spring formed at one end.

In a further very simple embodiment, the energy accumulator can comprise a pull spring or an elastic band. The arrangement is done suitably in this case such, that the pull springs or elastic bands are secured in the center below the cover sheet and outside on the end wall, so that a V-shaped arrangement results open towards the end wall. This embodiment has the advantage that only three pivotal points are required for the pull springs and the elastic bands, respectively, and that they consist of relatively few individual parts. Furthermore, this embodiment operates nearly free of any wear.

With these and other objects in view, which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of a completely pulled-out protective cover on a guide path for demonstration of the different energy accumulators with partly broken up cover sheets;

FIG. 2 is a perspective view of an end wall with energy accumulator pivotally secured thereto for demonstration of the inserted energy accumulator consisting of a pressure spring and blade springs and a guide tube partly broken away;

FIG. 3a is a top plan view of a protective cover with an energy accumulator in the released centered position;

FIG. 3b is a longitudinal section of the protective cover taken along the lines 3b-3b of FIG. 3a, but in the completely pulled-out position;

FIG. 3c is a longitudinal section of the protective cover taken along the lines 3c-3c of FIG. 3a, but in the completely collapsed position;

FIG. 3d is a section taken along the lines 3d-3d of FIG. 3b;

FIG. 4a is a cross section of a cover sheet and an end wall in elevation with energy accumulators consisting of rotary rods and rotary rod springs shown in the released center position;

FIG. 4b is a perspective view of the end wall of FIG. 4a with rotary rods and rotary rod springs;

FIGS. 5a, 5b and 5c are top plan views of the protective cover with energy accumulators consisting of pull springs or elastic bands in the released center position, in the pulled-out position and in the pulled-in position, respectively; and

FIGS. 6a—6c are top plan views of the protective cover of FIGS. 5a—6c with mirror image pivoted energy accumulators consisting of pull springs or elastic bands shown in the released center position, in the pulled-out position and in the collapsed position.

Referring now to the drawings, and in particular to FIG. 1, on guide paths 1a of a bed 1 of machine tool (not shown), a completely pulled-out protective cover 2 consisting of five cover sheets A, B, C, D and E is disclosed. The cover sheets A, B, C, D and E overlap relative to each other and consist of a cover sheet 3, sidewalls 4 with guides 5 angularly arranged for 90° in the lower range and forward end walls 6.

The end wall 6 projects at both ends slightly over the cover sheet 3 and forms there abutment ledges 7. In the center between the abutment ledges 7, the end walls 6 have a recess 8. Between the cover sheets 3 are provided stripping ledges 9, with which the cover sheets A, B, C and D abut on the abutment ledges 7. Running rollers 10 are mounted in the end wall 6, with which running rollers 10 the cover sheets B, C and D support themselves on the guide paths 1a. The protective cover 2 can be secured with the forward end wall 6 of the cover sheet A on a support of a machine tool (not shown), which support is schematically shown by example in FIGS. 3b and 3c. At the end of the bed 1, a console 12 is secured on which the last cover sheet E is disposed and over which the entire protective cover 2 can be moved into each other.

Between the cover sheets A, B, C, D and E, energy accumulators 20, 40, 60 or 70 can be provided as they are indicated in FIG. 1. In a practical embodiment, suitably only equal energy accumulators are arranged between the individual cover sheets of the protective cover 2. It is possible, however, also to combine from case to case different energy accumulators.

The energy accumulator 20 disclosed in FIG. 2 comprises a guide tube 21 with inserted pull rods 22. Either pressure springs 23 or plate springs 23 can be arranged on the pull rods 22 in the cylinder, which springs support themselves, on the one hand, on a pull plate 25 at the end of the pull rods 22, and, on the other hand, against pressure rings 26 screwable into the ends of the guide tube 21. The pull rods 22 are pivotally connected by means of eyes 27, on the one hand, below the cover sheet 3, and, on the other hand, on a console 28, which is secured in the center on the end wall 6.

The path of movement of the energy accumulator 20 during moving out and moving in, respectively, of the protective cover results from the different movement phases shown in FIGS. 3a to 3d in a top plan view and in section, respectively. In the released center position, according to FIG. 3a, the energy accumulator 20 is disposed in the recesses 8 of the end walls 6. Without any effect from the outside, the total protective cover 2 tends always to slide into this center position. Upon moving out of the protective cover 2 into the drawn-out end position shown in FIG. 3b, the pretension of the energy accumulator 20 is further increased, so that the drive (not shown) of the support 11 is released, upon moving in of the protective cover 2. It is apparent from FIGS. 3a, 3b, 3c and 3d, that the energy accumulator 20 is arranged in pairs behind each other. The force to be used for pretensioning of the total protective cover 2 corresponds thus with the sum of the pretensioning forces of two parallel arranged energy accumulator 20.

The energy accumulator shown in FIGS. 4a and 4b comprises substantially a rotary rod 41 and a rotary rod spring 42 which, by means of a serration 43 is connected together safe against rotation. The shaft of the rotary rod 41 is guided displaceably in longitudinal direction in guide eyes 44, which are secured swingably below the cover sheet 3. The rotary rod spring 42 is mounted adjacent the end wall 6 so as to be held at its bottom safe against rotation by a serration 45 at its lower end engaging a console 46. At its upper end, the rod spring 42

is rotatably mounted in the console 46 free for rotation at the end wall 6. In the released center position the rotary rods 41 are disposed in the recess 8 of the end wall 6. During shifting of the protective cover 2 in the pulled-out and pulled-in end position, respectively, the rotary rods 41 with the guide eyes 44 can swing through the recess 8 of the end wall 6.

The energy accumulator 60 comprises a pull spring 61, the end of which can be secured, on the one hand, to a console 62 and, on the other hand, below the cover sheet 3. The energy accumulator 70 comprises an elastic band 71, the ends of which can be secured likewise at the console 62 and below the cover sheet 3. In FIGS. 5a, 5b and 5c, the movement scheme for these two energy accumulators 60 and 70 is shown, which consists of a pull spring 61 or an elastic band 71. In this case, it is also possible to bring about the V-shaped arrangement of the energy accumulators in such manner, that a pull spring 61 and an elastic band 71, respectively, is pulled through an eyelet 72 secured in the center of the end wall 6.

The V-shaped arrangement of the energy accumulators 60 and 70 consisting of a pull spring 61 or an elastic band 71 can also be reversed, however, as it is disclosed in the movement scheme of FIGS. 6a to 6c. In this case, the ends of the pull spring 61 and the elastic band 71, respectively, are secured below the cover sheet 3 closely towards each other and on the end wall at the end of the recess 8 adjacent the abutment ledges 7.

All new features mentioned in the specification and shown in the drawings are essential for the present invention even so far as they are not claimed in the annexed claims.

While we have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

We claim:

1. A protective cover for guide paths of machine tools, comprising:
 - a plurality of overlapping cover sheets movable into each other telescopically;
 - running rollers and slide members, respectively;
 - each of said cover sheets being supported at the forward end wall with said running rollers and slide members, respectively, on the guide path and at the rear end on the next smaller of said cover sheets;
 - a plurality of energy accumulators producing return movement forces during movement out and movement in of said cover sheets from a center position, and disposed between said cover sheets; and
 - said return movement force being equal to zero in said center position and is greatest in the respective end positions upon moving-out and moving-in, respectively, of said cover sheets.
2. The protective cover, as set forth in claim 1, wherein:
 - always two equal of said energy accumulators are disposed at an angle towards each other between said individual cover sheets and are pivotally connected, on the one hand, at about the center of the upper of said cover sheets and on the end wall of the lower of said cover sheets, on the other hand.
3. The protective cover, as set forth in claim 2, wherein:
 - said end wall of said cover sheets has a recess within the range of the moving path of said energy accumulators.
4. The protective cover, as set forth in claim 3, wherein:
 - said energy accumulators disposed at an angle towards each other are pivotally connected to the end wall of said cover sheets closely adjacent each other on a joint console secured below said recess on said end wall.
5. The protective cover, as set forth in claim 4, wherein:
 - each of said energy accumulators comprises a guide tube with an inserted pressure spring and a plurality of inserted plate springs, respectively, and pull rods inserted from both sides; and
 - said pull rods are pivotally connected by means of eyes below said cover sheet and on said console.

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6. The protective cover, as set forth in claim 4, wherein:
each of said energy accumulators comprise a rotary rod
pivotaly secured below said cover sheet with a rotary rod
spring disposed in said console.
7. The protective cover, as set forth in claim 6, which in- 5
cludes:
guide eyes for a longitudinal displacement movement of
said rotary rods; and
said rotary rod spring is mounted safe against rotation with
serrations at the lower end in said console and at its upper 10
end in said rotary rod.
8. The protective cover, as set forth in claim 4, wherein:
each of said energy accumulators comprises a pull spring.
9. The protective cover, as set forth in claim 4, wherein:
each of said energy accumulators comprises an elastic band. 15

10. The protective cover, as set forth in claim 4, wherein:
each of said energy accumulators comprises an elastic
means.
11. The protective cover, as set forth in claim 10, wherein:
said elastic means are secured below said cover sheet, and
which includes an eyelet on said end wall; and
said elastic means are suspended from said eyelet.
12. The protective cover, as set forth in claim 10, wherein:
said elastic means are secured in the center below said
cover sheet closely adjacent to each other and at the end
wall at a larger distance from each other at the end of said
recess.
13. The protective cover, as set forth in claim 4, wherein
each of said energy accumulators includes at least one spring.

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