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 [21] Appl. No. **771,819**
 [22] Filed **Oct. 30, 1968**
 [45] Patented **Mar. 9, 1971**
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 [32] Priority **Nov. 9, 1967**
 [33] **Germany**
 [31] **P 16 27 069**

[56]

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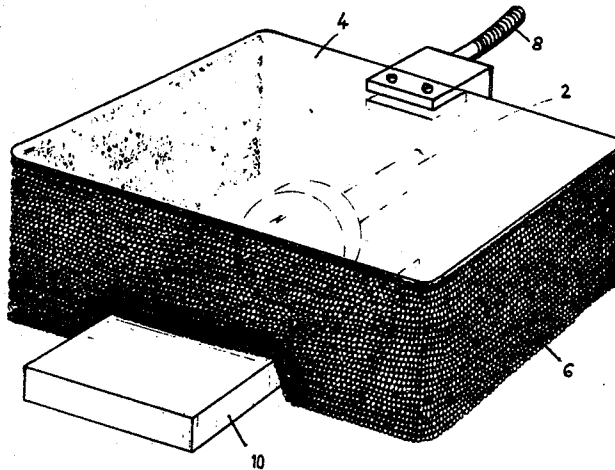
[54] **PROTECTIVE SHIELD**
12 Claims, 9 Drawing Figs.

[52] U.S. Cl. **90/11,**
 51/268, 77/55

[51] Int. Cl. **B23c 9/00,**
 B24b 55/00

[50] Field of Search **90/11;**
 143/157, 159, 159-7, 159-11; 144/252, 252.1;
 83/545, 544; 51/272, 268; 74/612, 608; 77/55;
 241/285, 189; 245/4, 9; 59/78; 140/3 (B), 3 (C)

ABSTRACT: A protective shield for a machine tool is comprised of a curtain made of chain mesh and which hangs downwardly to at least partially surround the machining zone to confine movement of the shavings.



Patented March 9, 1971

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3 Sheets-Sheet 1

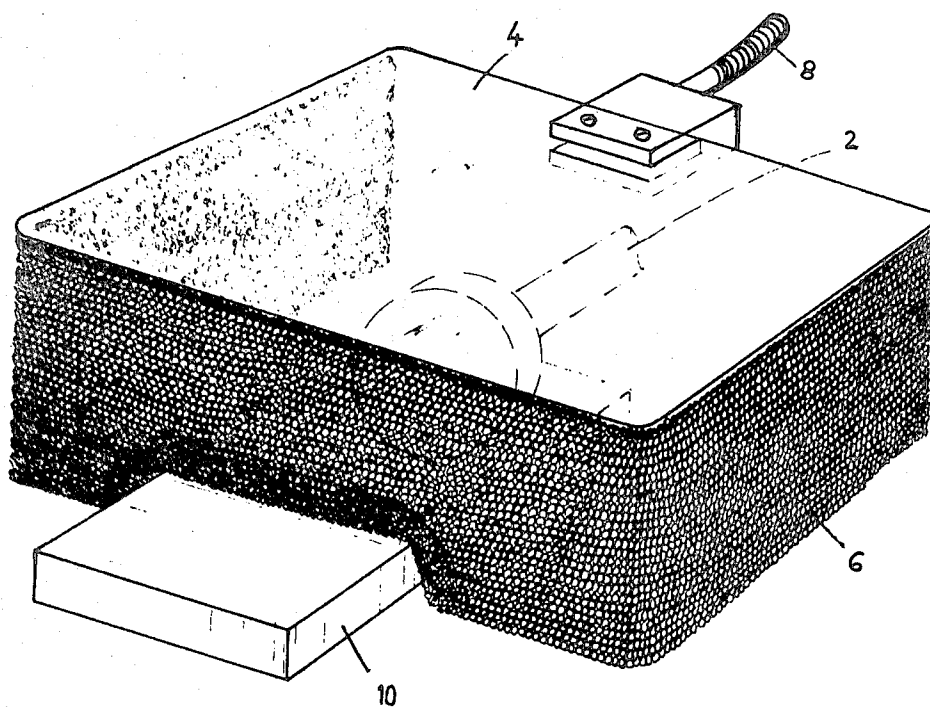


Fig. 1

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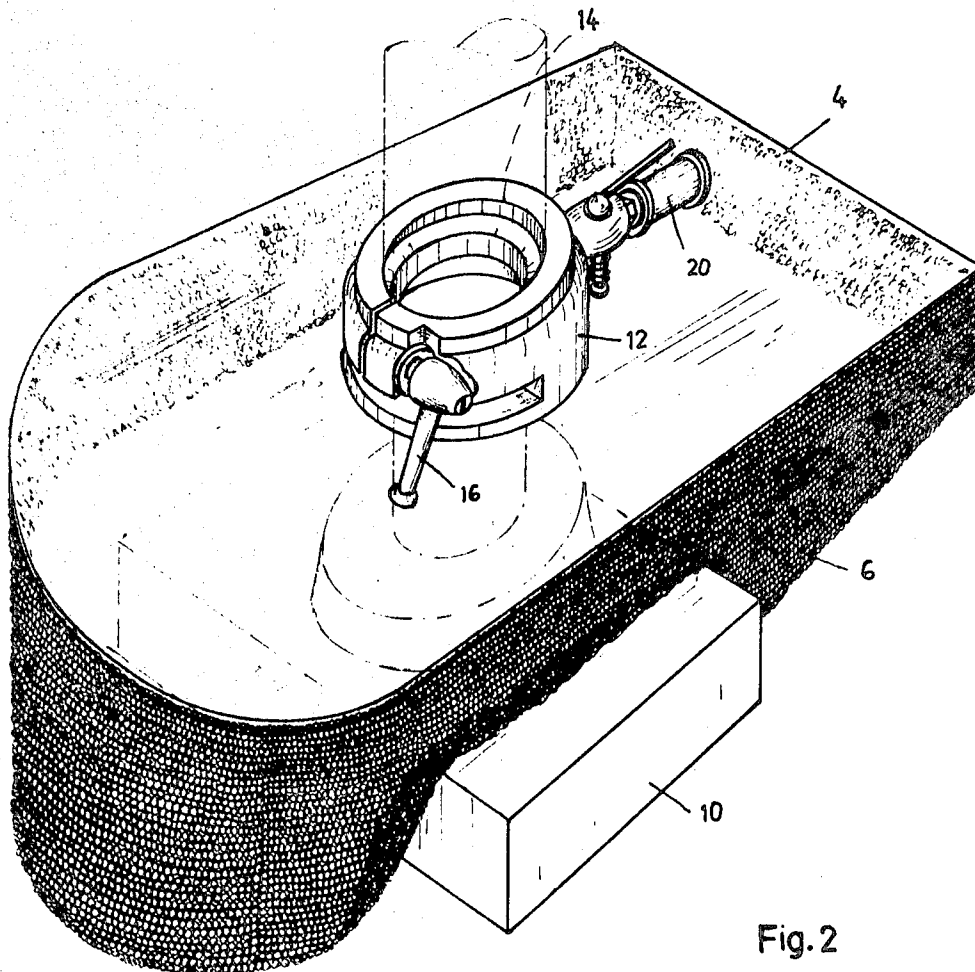


Fig. 2

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Fig. 3

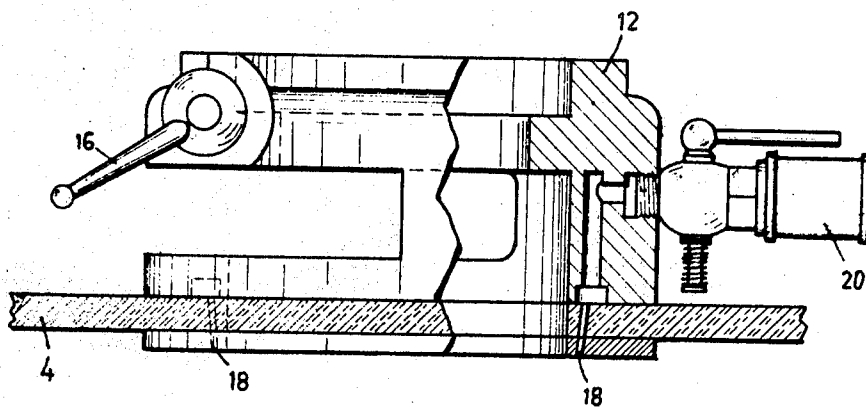
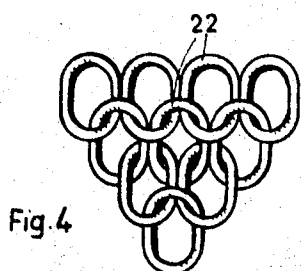


Fig. 4

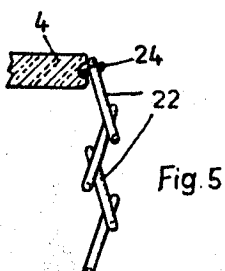


Fig. 5

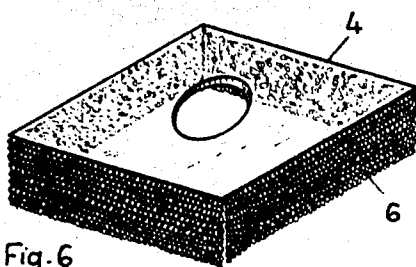


Fig. 6

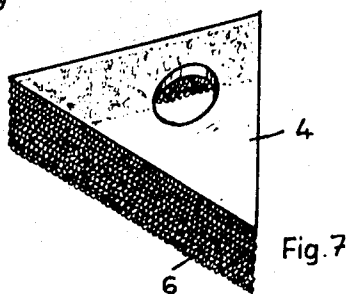


Fig. 7

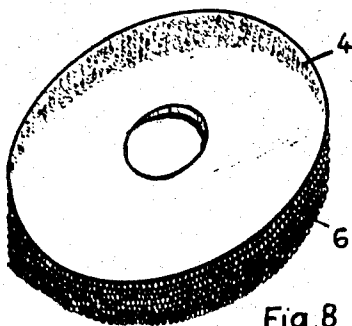


Fig. 8

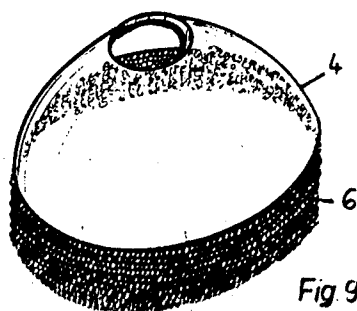


Fig. 9

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PROTECTIVE SHIELD

This invention relates to a protective shield which functions to prevent shavings, which form during machining of materials, from flying about in an unconfined manner. The shield is advantageously used with milling machines which have spindles rotating at a high speed. The shavings flying around during operation of milling machines are particularly dangerous because they are often red hot or even incandescent.

The protective shield of the invention has the shape of a curtain which consists of a chain mesh and which hangs vertically and protects at least one side of the zone around the workpiece being machined.

In a preferred embodiment of the invention, the chain mesh consists of round or oval wire (metal, such as steel) rings each of which is connected to four adjacent rings. A chain mesh of a similar type has, for example, been used for ladies' purses or wallets. The chain mesh is exceptionally satisfactory as a shield to confine shavings, in particular, because of the following characteristics:

- A. It is completely insensitive to mechanical and thermal stresses which may occur when shavings fly around.
- B. It is sufficiently smooth that the shavings are resiliently deflected thereby, without being caught in the mesh. This is particularly true when the wire rings are made of wire of a thickness of about 0.5 mm. and the diameter of the rings is approximately 3 mm.
- C. It can be easily collapsed to a small fraction of its full length and can be returned to its full extended length immediately as a result of its own weight. This characteristic is particularly important because the lower edge of the curtain automatically adjusts to the local unevennesses of the workpiece and a tight sealing around the machining zone is obtained.
- D. The multiple linkages of the mesh provide that it drapes snugly even over sharp edges of the workpiece without, however, being snagged thereon.

Further characteristics of the invention will become apparent from the following description of the preferred embodiments taken in connection with the accompanying drawings.

In the drawings:

FIG. 1 is a diagrammatic view of a protective shield in association with a horizontal milling spindle;

FIG. 2 is a diagrammatic view of a protective shield in association with a vertical milling spindle;

FIG. 3 is a partial cross-sectional view of an annular mounting device for mounting the support plate for the shield;

FIGS. 4 and 5 are front and side elevational views, respectively, of the mesh on an enlarged scale;

FIGS. 6 to 9 diagrammatically illustrate various shapes of the support plate and the shield.

Referring to the drawings, a transparent, rectangular plate 4 is, as illustrated in FIG. 1, arranged in a generally horizontal fashion above a horizontal milling spindle 2 of any conventional type. A flexible curtain 6 of chain mesh is suspended in a freely hanging fashion from the plate 4 adjacent three of the peripheral edges thereof. The zone under the central portion and the fourth edge of the plate 4 is open and unobstructed for receiving the spindle 2. The plate 4 is secured to a holder 8 which is advantageously made of a flexible tubing and which is magnetically, or by means of screws, connected to the milling machine body (not illustrated). A portion of the curtain 6 rests on the workpiece 10 and assumes the shape thereof and the remainder of the curtain engages the support surface, such as a table, for the workpiece so that flying shavings are caught and retained within the zone defined by the curtain 6 and the plate 4.

FIG. 2 illustrates the use of the curtain as applied to a vertical milling machine. Corresponding parts are identified by the same reference numerals as used in FIG. 1. The plate 4, provided with the curtain 6, is here clamped in an annular mounting device 12 which in turn is clamped to the bearing housing 14 of a vertical milling spindle. It will be noted that the curtain completely surrounds the milling zone.

The annular flange 12 (FIG. 3) has a clamp 16 for adjustably, releasably clamping the mounting device 12 to the housing 14. The mounting device 12 and the plate 4 have passages defining outlet bores 18 for cooling means, such as pressurized air or cooling water. The outlet bores 18 extend downwardly to direct the coolant toward the machining area. The outlet bores 18 are connected by means of a connector 20 to a suitable source for the coolant. It will be noted that the coolant is supplied by a passage to an annular manifold and the outlet bores 18 extend from said manifold.

As illustrated in FIGS. 4 and 5, the chain mesh forming the curtain 6 consists of oval wire rings 22, each of which is connected to four adjacent rings. This mesh assumes, if it is not prevented from doing so, its extended full length because of its own weight. But it can, on the other hand, be easily collapsed to snugly conform to the profile of the workpiece, as is illustrated in particular in FIGS. 1 and 2.

The curtain 6 is provided in form of an elongated strip of the chain mesh and its upper edge is secured to the outer edges of the transparent, such as safety glass (Plexiglas), plate 4. FIGS. 6 to 9 illustrate various shapes of the plate 4. The mounting of the curtain 6 on the plate 4 is accomplished by means of a binding wire 24 (FIG. 5) which is threaded through the wire rings adjacent the edge of the mesh and which is secured in a groove along the outer edge of the plate 4. A bell-shaped plate, such as illustrated in FIG. 9, is preferred in many cases because said shape allows a good view from the front into the machining area.

The shield of the invention, which is effectively used as a protection against flying shavings, is also effective for use on grinding machines where, by dimensioning the wire rings correspondingly, it more or less completely catches not only large particles, but also grinding dust. The shield can be cleaned by a hard shaking.

We Claim:

1. A protective shield for use with a machine tool to deflect chips during a machining operation, comprising means for connecting said shield to said machine tool to support the shield in the zone of said deflected chips, said shield having a plurality of link members, each link being interconnected to adjacent link members positioned longitudinally and transversely offset therefrom so as to form a unitary, flexible meshlike curtain of substantial height and width, said curtain being secured at one end thereof to a transparent plate, said plate supporting the curtain in a vertical position to surround a portion of a working tool, whereby an operator may view said machining operation through said transparent plate and said flexible curtain can be deformed by a workpiece, and chips therefrom will be deflected by said curtain.

2. A protective shield according to claim 1, wherein each link member comprises a closed wire ring and wherein each of said wire rings are interconnected to four adjacent longitudinally and transversely offset wire rings.

3. A protective shield according to claim 2, wherein said wire rings are made of wire having a thickness of about 0.5 mm. and the diameter of each of said wire rings is approximately 3 mm.

4. A protective shield according to claim 1, wherein the lateral distance of said curtain from said work tool equals at least said height of the curtain.

5. A protective shield according to claim 1 wherein said plate is horizontally oriented.

6. A protective shield according to claim 1 wherein said plate is bell-shaped.

7. A protective shield according to claim 1 wherein said plate is circular-shaped.

8. A protective shield according to claim 1, wherein said plate is made of safety glass.

9. A protective shield according to claim 1 wherein the outer edge of said plate is polygon-shaped.

10. A protective shield according to claim 1, wherein said machine work tool has a vertical spindle supported by a bearing housing and wherein said connecting means comprises an

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annular mounting device which includes means for clamping the device to the bearing housing of the said spindle.

11. A protective shield according to claim 1, in which the annular mounting device has outlet bores for cooling means, said bores extending transversely to the axis of the annular mounting device toward the machining area, said outlet bores

being communicable with a connector associated with the annular mounting device.

12. A protective shield according to claim 1 wherein said plate is oval-shaped.

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