

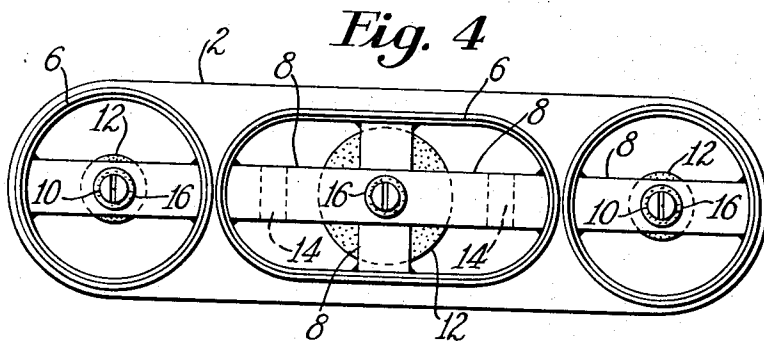
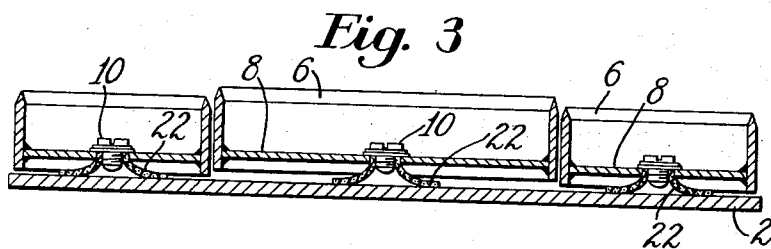
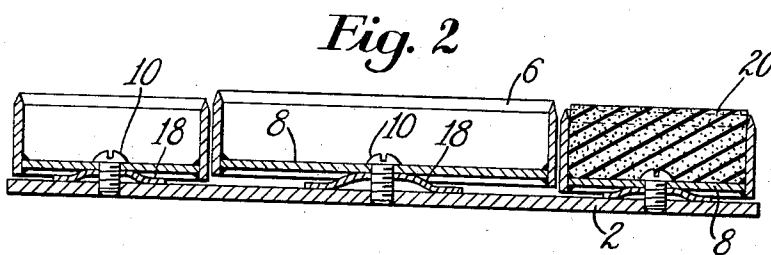
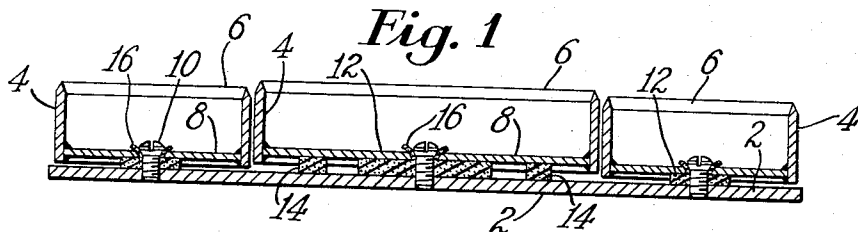
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APPARATUS FOR PUNCHING OUT WORKPIECES

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APPARATUS FOR PUNCHING OUT WORKPIECES

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ABSTRACT OF THE DISCLOSURE

Apparatus for punching out workpieces from sheet material, the apparatus including a support and punching means mounted on the support. Means are provided for attaching the punching means to the support so that the punching means is movable in directions normal to the plane of the support and in directions other than normal to the plane of the support.

This invention relates to press type machines and is directed more particularly to an apparatus for punching or stamping out workpieces from sheet material.

Such machines are known in the art and comprises a series of cutting tools or knives rigidly attached to a support. The knives are made of strip steel shaped in the form of the workpiece to be cut. Usually, a support plate carries a plurality of strip steel knives arranged as close to each other as possible and engageable with a sheet of leather, rubber, plastic, metal, web of textile material, or the like, for the purpose of cutting out workpieces required in the construction of clothes, shoes, etc. Difficulty has been experienced in the use of such machines because of the jamming of waste portions of the sheet material between adjacent knives. The removal of such waste portions is time consuming and sometimes dangerous to personnel. Further, the cut workpieces and the knives may be damaged during the waste removal operation. Still further, the knives must be spaced apart a sufficient distance to permit a tool of some sort to be projected therebetween for the purpose of removing the waste material.

Accordingly, it is an object of the present invention to provide means which permit the quick and easy removal of waste material from between adjacent knives.

A further object of the invention is to facilitate arrangement of the knives on a support as closely together as possible in order to reduce the percentage of waste material.

Yet another object of the invention is to facilitate the removal of the cut workpieces from within the knives.

With the above objects in view, and in accordance with a feature of the invention the illustrative apparatus comprises a plurality of cutting knives arranged with very slight spacing from each other on a common support plate, each knife being yieldingly connected to said support plate. Such a yielding connection may, for example, be an elastic connection comprising one or more pins, screws or rivets and at least one elastic washer of rubber or like material arranged between the base of a knife and the support plate, the rubber washer having sufficient thickness to provide for a clearance between the back of the knife and the surface of the support plate facing the back of the knife. In the preferred embodiment of the invention two elastic washers are provided, one of the washers being arranged between the back of the knife and the support plate while the other washer reaches through an aperture in the back of the knife. A pin or the like extends through both washers, connecting the knife to the support plate in a manner which permits some freedom of movement of the knife.

Reference is made to the accompanying drawings in

which there is shown an illustrative embodiment of the invention from which its novel features and advantages will be apparent. It is to be understood, however, that the present invention is by no means limited to the particular constructions shown in the drawings, but also comprises any modifications within the scope of the appended claims.

FIG. 1 is a sectional view of one form of apparatus embodying the invention;

FIG. 2 is a sectional view through another embodiment of the invention;

FIG. 3 is a sectional view through still another embodiment of the invention, and

FIG. 4 is a plan view of the apparatus of FIG. 1.

Referring to FIG. 1, it may be seen that the illustrated machine includes a support plate 2 to which are yieldingly connected a plurality of strip steel knives 4. The spacings between adjacent knives is minimal in order to reduce the amount of waste material generated by each cutting operation. Each knife 4 has a cutting edge 6 and is of a shape complementary to the desired shape of the workpiece to be punched out. Each knife is, depending upon its configuration and size, attached to one of several crosspieces 8. The connection between each knife 4 and its crosspieces or pieces 8 may be accomplished by welding or soldering, or in any other suitable manner.

The connection between the crosspiece 8 and the support plate 2 comprises a pin 10, screw, or rivet or the like, extending through at least one yieldable elastic washer 12. It is to be understood, however, that the pin 10 need not necessarily extend through the washer 12 inasmuch as elastic blocks 14 (FIGS. 1 and 4) may be cemented between the crosspiece 8 and the support plate 2 away from the screw. As is necessary for controlling the degree of yielding of the knives relative to the support plate, the elastic means, such as washers 12 or blocks 14, may be used in combination, as shown in FIG. 1.

The thickness and elasticity of the elastic means is selected to provide a clearance between the back of each knife, i.e., the crosspiece, and the surface of the support plate which provides a space into which the knife can yield in the punching operation. In the invention as illustrated in FIG. 1, the knives are attached to the support plate by means of screws 10 and two elastic washers 16 and 12. One washer 12 is placed between the surface of the support plate 2 and the crosspiece 8. The other washer 16 extends through an aperture in the crosspiece 8. The screw or rivet 10 extends through both washers 16, 12.

FIG. 2 shows that the elastic washers or blocks may be replaced by spring means 18 such as a leaf or plate spring. The embodiment of FIG. 2 also illustrates the use of an ejector means 20 (seen in the right hand knife of FIG. 2), such as a foam rubber pad within the space bound by the knife. The pad 20 is compressed as the space bound by the knife is filled with the punched out workpieces and the elasticity of the pad ejects or greatly facilitates the ejection of the punched out workpieces.

FIG. 3 shows still another embodiment of the invention utilizing elastic or resilient washers 22 cemented or otherwise attached to the support plate 2. In this embodiment the screw 10 serves merely to connect the crosspiece 8 to the washer 22.

Because of the yielding action of the elastic or spring means employed according to the invention, the individual knives can move slightly relative to each other, permitting quick and easy removal of waste material disposed between adjacent knives. The knives are movable in a direction normal to the plane of the support and may be tilted about the pins 10. In addition, the embodiments illustrated in FIGS. 1 and 3 have a slight degree of freedom in a direction parallel to the plane of the support.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. Apparatus for punching out workpieces from sheet material comprising a support, punching means, each of said punching means having a back portion, and yieldable means for attaching the punching means to the support, said yieldable means comprising at least one yielding member connected at one end to said support and connected at its opposite end to the back portion of a punching means, said yielding member permitting the punching means to move in directions normal to the plane of said support and in directions other than normal to the plane of said support.

2. Apparatus for punching out workpieces from sheet material comprising a support, a plurality of punching knives disposed on said support, each of said knives having a back portion, and yieldable means interconnecting said support and each knife, said yieldable means comprising at least one yielding member connected at one end to said support and connected at its opposite end to the back portion of a knife, said yielding member permitting the knife to move in a direction parallel to the plane of said support.

3. Apparatus for punching out workpieces from sheet material comprising a support, a plurality of punching knives disposed on said support, each of said knives having a back portion, and yieldable means interconnecting said support and said knives, said yieldable interconnecting means comprising at least one yielding member disposed between the back portion of a knife and the support, said yielding member permitting movement of said knife relative to said support in directions having a vector parallel to the plane of said support.

4. The invention according to claim 3 in which said yielding member is an elastic washer.

5. The invention according to claim 3 in which said yielding member is an elastic block.

6. The invention according to claim 3 in which said yielding member is a spring member.

7. Apparatus for punching out workpieces from sheet material comprising a support, a plurality of punching

knives disposed on said support, each of said knives having a back portion having an aperture therethrough, and means interconnecting said support and each of said knives comprising a headed pin disposed in said aperture and connected to said support, and a yielding member having an aperture and disposed between said support and the back portion of a knife, said pin disposed in the aperture of said yielding member, said yielding member permitting movement of said knife about said pin.

8. Apparatus for punching out workpieces from sheet material comprising a support, a plurality of punching knives disposed on said support, each of said knives having a back portion with an aperture extending therethrough, and means interconnecting said support and each of said knives comprising a headed pin disposed in said aperture and connected to said support, an elastic washer disposed between a knife and said support, and a second elastic washer disposed partly within said aperture, said pin extending through said elastic washers.

9. In an apparatus for punching out workpieces from sheet material comprising a support and a plurality of punching knives disposed on the support, that improvement comprising means for mounting said knives on said support to permit movement of each of said knives relative to said support in a direction parallel to the plane of said support, said mounting means comprising at least one yieldable member disposed between a knife and the support, and means for connecting the knife to the support with the yieldable member retained therebetween.

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