United States Patent [19]

Chafee

[11] **3,779,123**

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[54] **KNIFE HOLDER AND KNIFE THEREFOR**

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[73] Assignee: **Cumberland Engineering Company, Inc.**, Attleboro, Mass.

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[52] **U.S. Cl.** **83/698**, 83/349, 83/356.3, 83/856

[51] **Int. Cl.** **B26d 1/02**, B26d 1/38, B26d 7/26

[58] **Field of Search** 83/349, 356.3, 698, 83/856, 699

[56] **References Cited**

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Primary Examiner—Frank T. Yost
Attorney—Burnett W. Norton

[57] **ABSTRACT**

A knife holder and knife therefor to be used on a machine for dicing or cutting plastics, the knife holder being an elongated body having a channel therein, the channel being shaped to hold an elongated insertable knife blade against the front wall of the channel, and an elongated wedge mounted between the knife and the back wall of the channel to clamp the knife securely in the knife holder. The walls of the channel are divergent from each other. The cooperation between the knife, wedge, and front and back walls of the channel is such that wedge-fastening screws or bolts have reduced forces acting on them. In a second embodiment, means are also provided whereby regound or replacement knives may be fitted into the knife holder with a minimum of adjustment necessary in respect to the fly knives of the machine.

12 Claims, 7 Drawing Figures

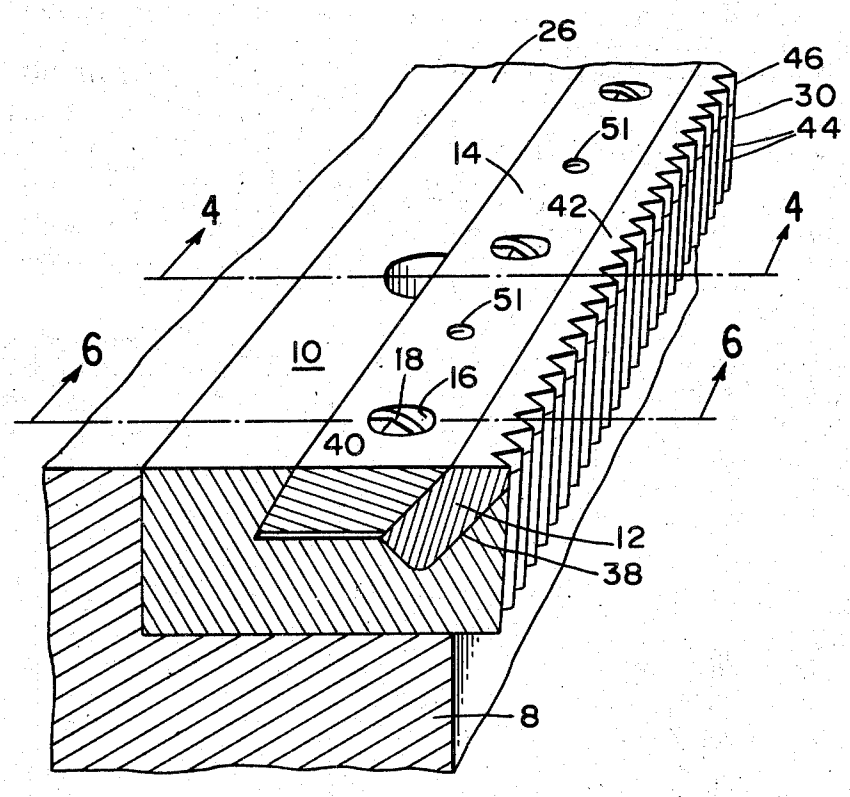


FIG. 1

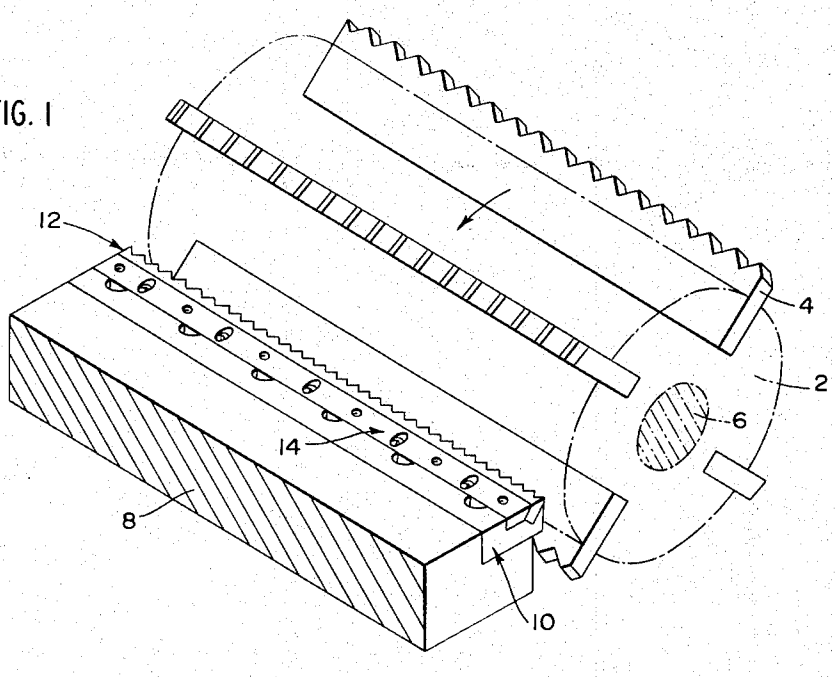
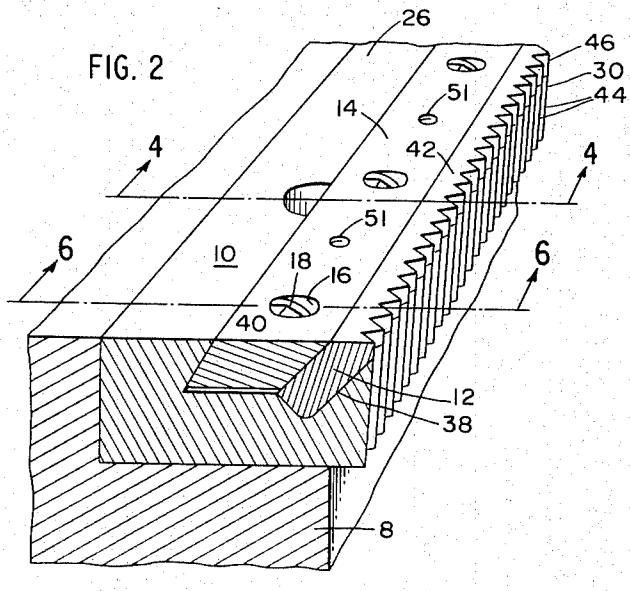


FIG. 2



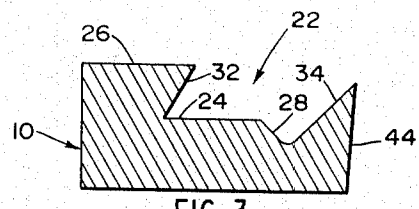


FIG. 3

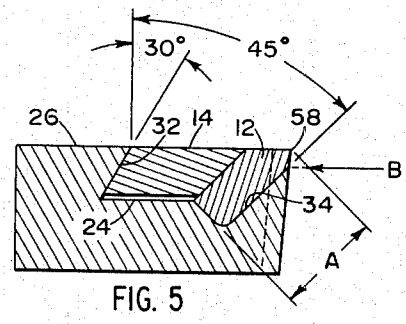


FIG. 5

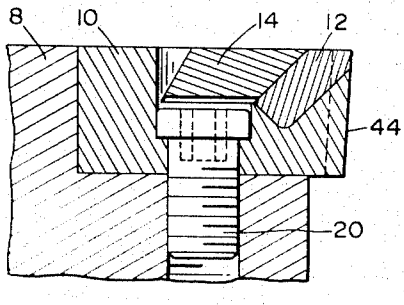


FIG. 4

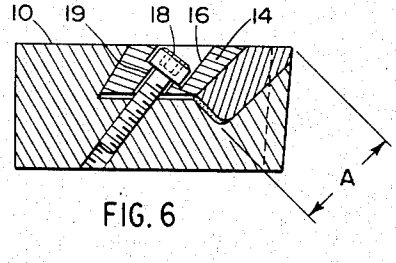


FIG. 6

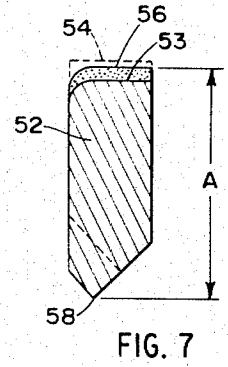


FIG. 7

KNIFE HOLDER AND KNIFE THEREFOR

BACKGROUND OF THE INVENTION

The art of fastening knives into holders is extensive. However, previous means for so doing, particularly where wedging means are used, have been deficient in certain aspects, as follows: One of the problems concerned with prior wedging means is that the force which needs to be exerted by the screws which retain the wedge in place and force it against the knife, is too great. Another disadvantage is that when wedging means are used to wedge down against the knife to hold it securely in place, it often becomes difficult to remove both the wedge and the knife.

A further difficulty with prior art devices is that when an assembly of a knife and holder is first made, the knife is generally inserted into the holder, and then the knife and the holder are ground together so that the dimensions necessary for use in the machine are accurately fixed. Thereafter, when the knife wears and needs to be re-ground, or a new knife is to be substituted for the worn one, it is necessary either to regrind the knife and holder, or to make extensive adjustments, both of which mean down-time for the machine, that is, time when the machine is not doing productive work. Such down-time can be expensive to the user of the machine.

SUMMARY OF THE INVENTION

Accordingly, one object of this invention is to provide a knife holder and a knife therefor, in which, when the knife is inserted in the machine, calibration of the knife with respect to the holder and other parts of the machine is automatic and accurate with a bare minimum of adjustment necessary.

A second object of the invention is the provision of a knife holder and knife therefor characterized in that when a knife is to be resharpened, the width of the knife is so adjusted that when the user of the knife reinserts it into its holder on the machine, the position of the knife with respect to other parts will, as aforesaid, be positioned with only a bare minimum of adjustment necessary.

Yet another object in the invention is the provision of a knife holder and knife therefor of either of the kinds above, in which the forces needed to be exerted by the bolts or fastening means which hold the wedge (and thus the knife) in the holder, are minimized by the shape of the holder and wedge.

Other objects and advantages will be in part apparent and in part pointed out hereinafter.

Accordingly, the invention comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawings, in which two of the various possible embodiments of the invention are illustrated:

FIG. **1** illustrates schematically a typical plastic dicing machine, but in which the knife holder and knife combined therewith of this invention are shown mounted in position to cooperate with the rotary fly knives of the machine;

FIG. **2** is an enlarged sectional view of a portion of the knife and its holder of the FIG. **1** embodiment;

FIG. **3** is an end elevation of the holder (without knife and wedge) of FIG. **2**;

FIG. **4** is an enlarged cross-section taken in the direction of sight lines **4—4** on FIG. **2**;

FIG. **5** is an end view of the holder and knife of FIGS. **1** and **2**, given to illustrate certain angular relationships of surfaces within the holder, and dimensions of certain portions of the holder and the knife fastened therein;

FIG. **6** is a sectional view taken in the direction of sight lines **6—6** on FIG. **2**; and

FIG. **7** is an end view of a second embodiment of the invention, the view illustrating another knife to be used in combination with the holder of FIG. **2**.

Throughout the drawings, similar reference characters indicate corresponding parts, and dimensions of certain of the parts as shown in the drawings may have been modified and/or exaggerated for the purpose of clarity of illustration and understanding of the invention.

Referring now to FIG. **1**, there is illustrated one embodiment of the invention shown in its operative relationship with a typical set of rotary knives of a standard dicing machine such as that manufactured by Cumberland Engineering Company Inc. of South Attleboro, Mass., and illustrated in their Bulletin No. 640. The dicing machine has a rotor **2** having mounted thereon the plurality of toothed dicing knives **4**, the rotor being mounted on a shaft, a section **6** of which is shown. (The rotor is illustrated schematically since it is not part of this invention.) Cooperating with the rotary knives **4** is a bed knife assembly mounted on a bed **8** of which only a portion is shown, the assembly of the knife holder **10**, knife **12** and wedge **14** which comprise this invention.

It will be understood that the remaining parts of the dicing machine which are not illustrated here, are conventional, and may be found in machines manufactured by the above referred to Cumberland Engineering Company Inc.

Referring now to FIG. **2**, there is illustrated (in enlarged detail as compared to FIG. **1**), a portion of the bed **8**, and a portion of the knife holder **10**, its knife **12**, and wedge **14** which cooperate with the holder **10** to clamp the knife **12** in its desired position. The wedge **14** is provided with the counter bores **16** and suitable holes **19** through which pass the bolts or machine screws **18** which draw the wedge **14** down into its locking position, the bolts **18** threading into suitable holes in the holder **10**.

In the illustration, the holder **10** is fastened to bed **8** by means of bolts **20** in conventional manner, prior to the insertion of the knife **12** and the wedge **14** into the holder.

From an examination of the drawings (see FIGS. **2–3**), it will be clear that the holder **10** is provided with a channel **22** having a bottom which has a portion **24** approximately parallel to the top surface **26** of the holder, and a remaining portion **28** which diverges downwardly and away from the portion **24** and toward the front surface **30** of the holder. The channel is provided with a back wall **32** and a front wall **34** as shown.

Referring now to FIG. **5**, certain angular relationships of these walls is shown as follows: the wall **32** makes an acute angle with the plane of bottom portion **24** of the channel and is preferably at a 30° angle to the vertical, that is, a 60° angle to the bottom **24**. The wall **34** makes an obtuse angle with the plane of the bottom portion **24** and is preferably at an angle of approxi-

mately 135° to the bottom **24,** that is, an angle of 45° to the vertical. Thus, it will be observed that the walls **32** and **34** diverge from each other, and the angular diversion is approximately 15°. While this is the preferred relationship, other angles may be used, and the angles chosen will affect the clamping action of the wedge **14.** For example, if the angular diversions between walls **32** and **34** is made less, for example, 5°, then the clamping force exerted by the wedge against the inserted knife will be greater, but it will be more difficult to remove both the wedge when it is desired to remove the knife. Correspondingly, if the divergence is made greater than 15°, then it will be found that while it is easier to move the wedge, nevertheless the wedging action is not as great and therefore the wedging screws **18** will have to exert a greater force.

Knife **12** extends the length of the holder **10** itself. The knife has parallel faces **38** and **40,** and when the knife is positioned in the holder, face **38** rests against wall **34.** Therefore, the knife itself assumes the angular tilt of the wall **34.** The other face **40** is exposed to be engaged by the wedge **14.** The latter is provided with sloping surfaces which match the angles of the walls **32** and the wall **34.** Thus, when the clamping screws **18** are tightened down, the resultant forces exerted by the wedge will be to clamp the knife **12** securely in the holder. The bottom of the knife rests against portion **28** of the channel bottom.

In general, an initial knife is made greater in width than the distance of surface **28** from the top surface **26** of the holder, and the wedge **18** is then inserted and tightened down. Thereafter, the top surface **42** of the knife is ground down to be level with the top surface **26** of the holder, and by suitable forming means teeth **44** are cut in both the forward surface **30** of the holder and the upwardly forward edge portion **46** of the knife. As desired, cutting clearance is provided as to the combined forward walls of the knife and the holder.

Suitable threaded holes **51** are provided in the wedge **14,** in order to assist in lifting the wedge from the holder when it is desired to change a knife. Threaded rods are temporarily threaded into these holes to act as handles to lift the wedge.

It will be thus observed that from the cutting points **50** of the knife to the lower edge portion or bottom of the knife there will result a predetermined distance illustrated by A in FIGS. **5** and **6.** It will also be observed that the forward surface **30** of the holder terminates short of the plane of the top surface **26** of the holder, as illustrated by arrow B in FIG. **5.**

As a result of this construction, forces being exerted against the forward edges of the knife **12** during use for dicing plastic materials will generally resolve into forces driving the knife directly down against its firm seating on portion **28** of the bottom channel; and forces causing a moment in the knife about a pivot point at the point B, which forces will be exerted against the face of the wedge which rests against the face **40** of the knife. These forces will then be opposed by angular wall **32** of the channel. As a result of this, it will be observed that in this invention the forces which need to be exerted by the clamping screws **18** are minimized as compared to prior art machines in which the clamping screws must resist all of the forces.

It will be noted that the clearance holes **19** for the bolts **18** are made somewhat larger than usual. As indicated above, the forces required to be exerted by the screws **18** in this invention are less than is found in prior art devices, and laterally directed forces against the wedge will be resisted by the wall **32.** Therefore, the bolts **18** do not and should not be subject to such forces. Consequently, the clearance holes are made larger than usual.

It will be realized that while in the above description knife holder **10** is shown and described as an element separate from bed **8,** nevertheless, the bed **8** itself may be formed with the proper channel and wedge to receive a knife as described above.

Another advantage of the invention will now be described, and this will be in connection with a variation of the invention which is herein called the second embodiment. As has been pointed out above, knives used in such machines wear out and either need to be reground, or new knives need to be inserted to replace the worn out ones. Where the knife material is relatively inexpensive (such as, for example, types D2, A7, A8 and other tool steels), then it may be more economical to throw away the old knives, rather than regrind them. If this is done, new knives must be substituted for the old ones. On the other hand, where the knives are made of tungsten carbide or similar material, the knives are relatively expensive, and they will be returned to the knife manufacturer for regrinding.

When knives are returned for regrinding and then reused, or when a new knife is to be used, both either must be dimensioned substantially exactly the same as the dimension of the initial knife **12** shown in FIG. **2,** or expensive adjustments of the knives need to be made with respect to the rotary knives **4.** Such adjustments are time-consuming and therefore expensive. This invention provides a way of treating a knife that has been reground (or sizing a new knife) so that when such a knife is fitted into the holder, it will come into place in respect to the rotary knives **4** exactly as was the original knife **12** when the latter was new. The following description will first apply to the case where a carbide knife is to be reground and then returned to the user for insertion in the machine.

Such a carbide knife **52** is shown in FIG. **7.** After the knife has been reground, to the bottom **53** of the knife there is added such as by way of arc deposition or metal spraying a layer **54** of additional metal (illustrated by dotted lines in FIG. **7**). After this layer has solidified and cooled, it is then cut off in a predimensioned jig to the level indicated by numeral **56,** so that the span from the point **58** of the knife and the level so prepared is equal to the dimension A. It will be recalled that dimension A is the dimension that was originally established between the points **58** of the initial knife and its bottom, when the first knife was placed in this holder and ground.

In FIG. **7,** for clarity, the thickness of the residual added layer of metal has been exaggerated, and generally will be much less than shown.

It is thus to be seen that by this invention, a user can always have on hand a set of blades which will always be self-positioning in the holder so as to be in proper cutting engagement with the rotary knives **4.**

A further advantage of the invention is that the knife is strongly backed up by the forward surface **30** of the holder over almost the entire width of the knife. This permits the use of an insertable knife which is smaller than would otherwise be the case.

In view of the above it will be seen that the several objects of the invention are achieved and other advantageous results attained.

It is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

As many changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings, shall be interpreted as illustrative and not in a limiting sense, and it is also intended that the appended claims shall cover all such equivalent variations as come within the true spirit and scope of the invention.

Having described the invention, what is claimed is:

1. In combination, an elongated knife holder and a knife therefor for a cutting machine having rotary cutters with which the knife is adapted to cooperate, the holder having a top surface and a front surface and being provided with a channel therein to receive the knife; the channel having a bottom surface, a front wall and a back wall contiguous with said bottom surface, the front wall and the back wall being inclined away from each other at a predetermined angle, the front wall being at an obtuse angle to the plane of the bottom surface, and the back wall being at an acute angle to the plane of the bottom surface; a first portion of the bottom surface being approximately parallel to the top surface; a second portion of the bottom surface lying at an angle to the first portion of the bottom surface and sloping downwardly and toward the front surface of the holder; a knife lying in said channel with one side thereof against the front wall thereof, the other side of the knife facing toward the back wall, and the bottom surface of the knife seated against the second portion of the bottom surface of the channel; and a wedge removably and adjustably fastened into the channel between the knife and the back wall by fastening means and engaging the back wall and said other side of the knife thereby to hold the knife in the channel.

2. The combination of claim **1** in which the front surface of the holder terminates short of its top surface, and said knife is so formed that when the latter is clamped in the holder, an upper forward edge portion thereof is exposed and lies adjacent the cutting path of said rotary knives.

3. The combination of claim **1** in which the angle of slope of the second portion of the bottom surface of the channel is the same as the angle that the bottom surface of the knife makes with the sides of the knife.

4. The combination of claim **3** in which the angle the bottom surface of the knife makes with the walls thereof is approximately 90°.

5. The combination of claim **1** in which the angle that the back wall of the channel makes with the plane of the bottom surface of the latter is approximately 60°, and the angle the front wall of the channel makes with the plane of the bottom of the latter is approximately 135°.

6. The combination of claim **2** in which the upper forward edge portion of said knife is provided with first teeth and the front surface of the holder is provided with second teeth in alignment with said first teeth.

7. The combination of claim **6** in which the total width of said knife from its forwardmost cutting point to its bottom surface is such that when the knife is seated against the second bottom portion of the channel, the teeth of the knife and of the front surface of the holder are in alignment.

8. The combination of claim **7** in which the knife comprises a body and a layer of additional spacer material of predetermined thickness attached to the bottom surface of the body, the total width of the knife including the width of the knife per se and said predetermined thickness.

9. An elongated knife holder for a knife, the holder having a top surface and a front surface and being provided with a channel therein to receive a knife longitudinally; the channel having a bottom surface, a front wall and a back wall contiguous with said bottom surface, the front wall and the back wall being inclined away from each other at a predetermined angle, the front wall being at an obtuse angle to the plane of the bottom surface, and the back wall being at an acute angle to the plane of the bottom surface; a first portion of the bottom surface being approximately parallel to the top surface; a second portion of the bottom surface lying at an angle to the first portion of the bottom surface and sloping downwardly toward said front surface; and a wedge adapted to be removably and adjustably fastened into the channel by fastening means and adapted to engage said back wall and one side of the knife when the latter is in the channel thereby to force the knife against the front wall of the channel.

10. The holder of claim **9** in which the front surface of the holder terminates short of the top surface of the latter.

11. The combination of claim **9** in which the angle of slope of the second portion of the bottom surface of the channel is the same as the angle that the bottom surface of the knife makes with the sides of the knife.

12. The combination of claim **9** in which the angle the back wall makes with the plane of the bottom surface is approximately 60°, and the angle the front wall of the channel makes with the plane of the bottom surface is approximately 135°.

* * * * *