April 4, 1961 D. SWINDEN 2,977,678

POCKET KNIFE AND METHOD OF MAKING SAME

Filed Jan. 6, 1960 3 Sheets-Sheet 1

Fig. 1.

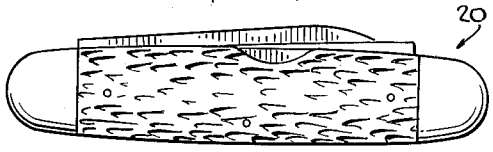


Fig. 2.

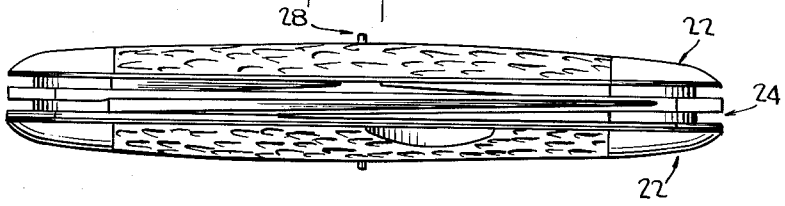


Fig. 3.

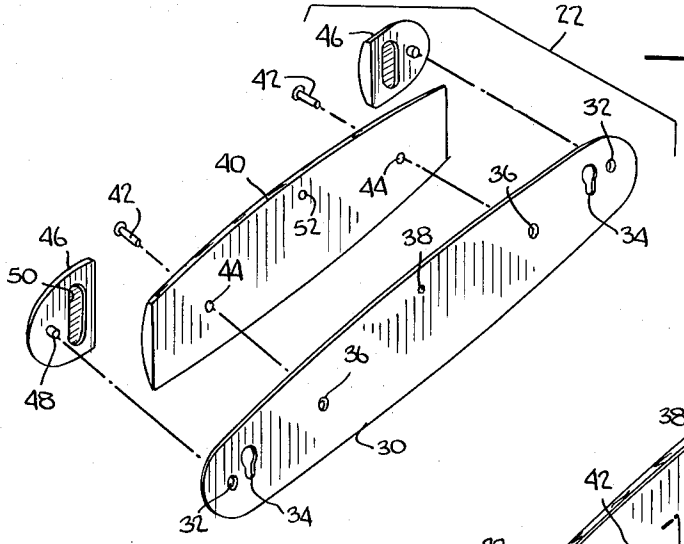


Fig. 4.

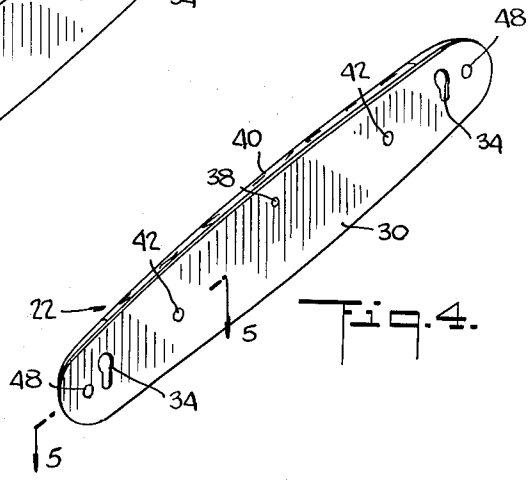
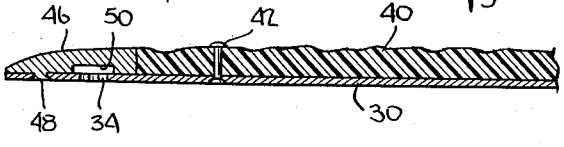


Fig. 5.



INVENTOR.
DAVID SWINDEN

BY
Kuschman, Kuschman & Klinger

ATTORNEYS

April 4, 1961 D. SWINDEN 2,977,678

POCKET KNIFE AND METHOD OF MAKING SAME

Filed Jan. 6, 1960 3 Sheets-Sheet 2

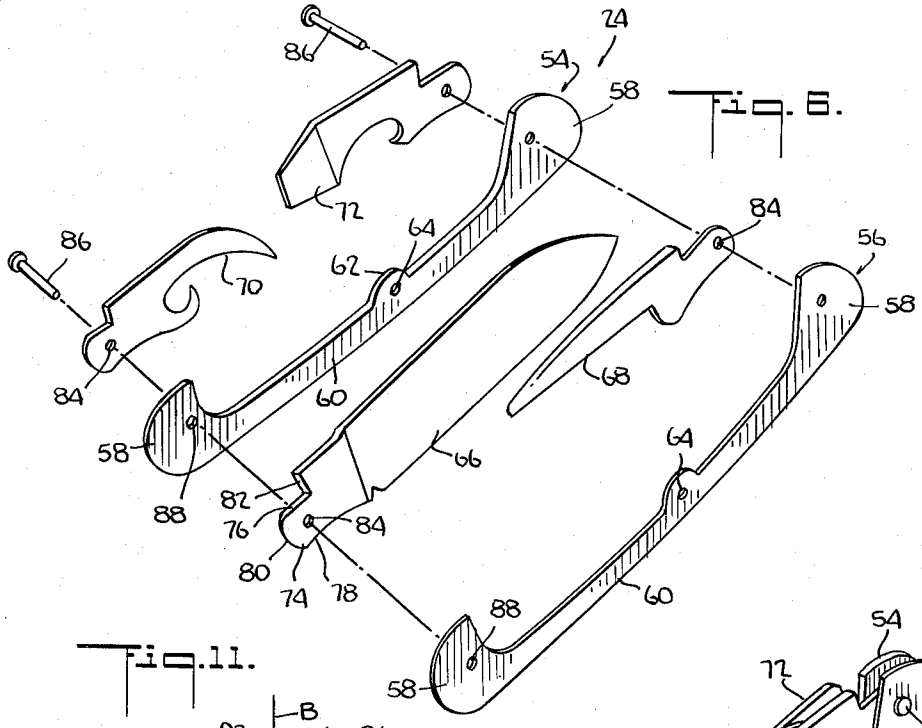


Fig. 6.

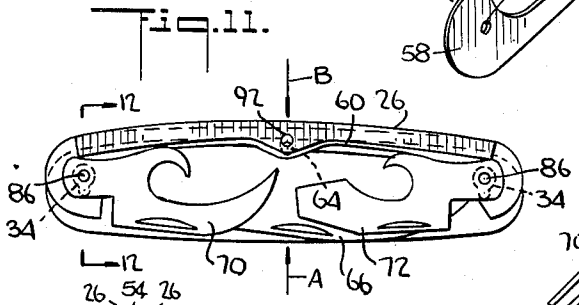


Fig. 11.

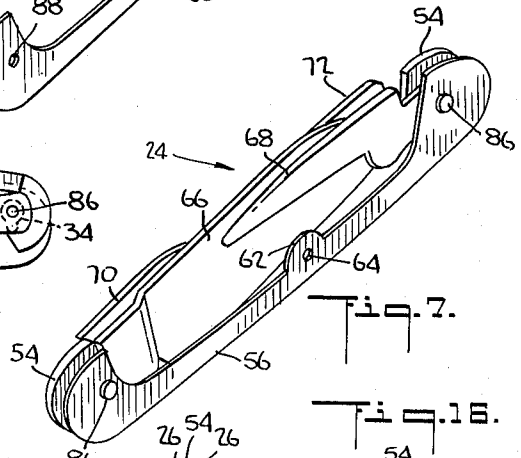


Fig. 7.

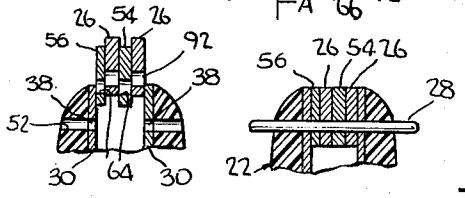


Fig. 13.

Fig. 17.

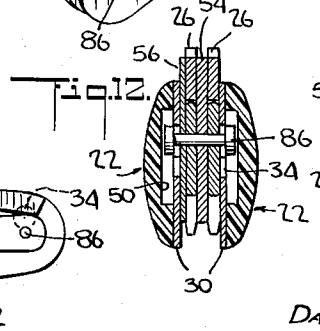


Fig. 12.

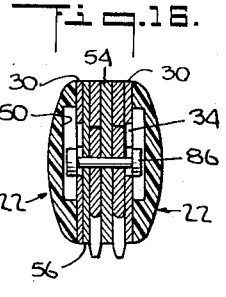


Fig. 16.

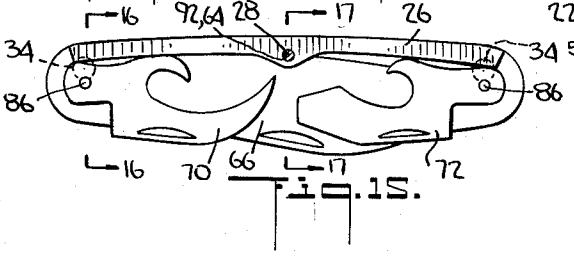


Fig. 15.

INVENTOR.
DAVID SWINDEN

BY
Kirschstein, Kirschstein, Ottinger

ATTORNEYS

April 4, 1961 D. SWINDEN 2,977,678

POCKET KNIFE AND METHOD OF MAKING SAME

Filed Jan. 6, 1960 3 Sheets-Sheet 3

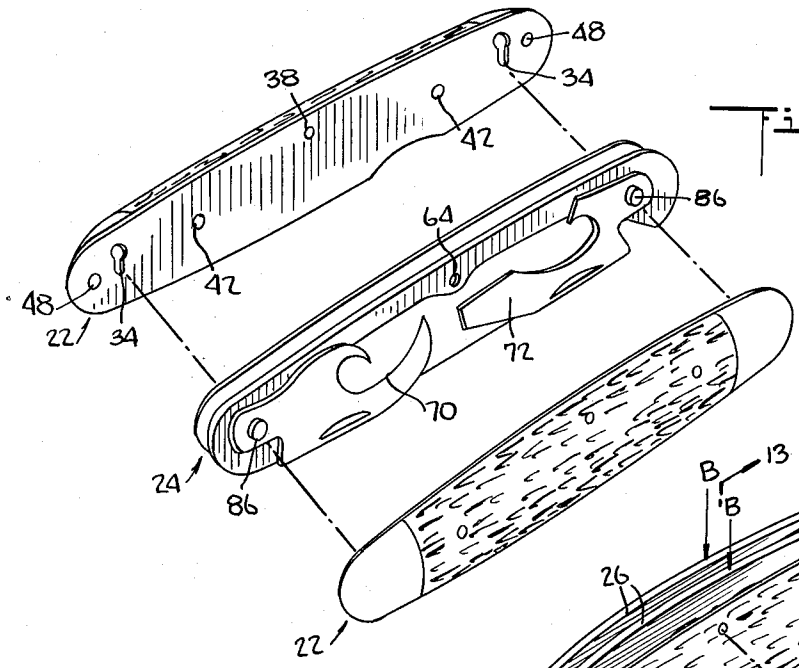


Fig. 8.

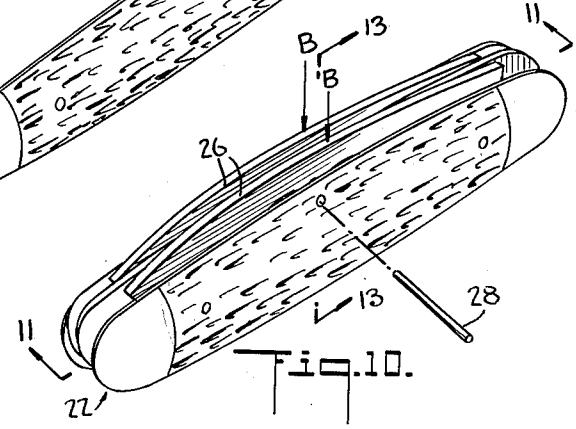


Fig. 10.

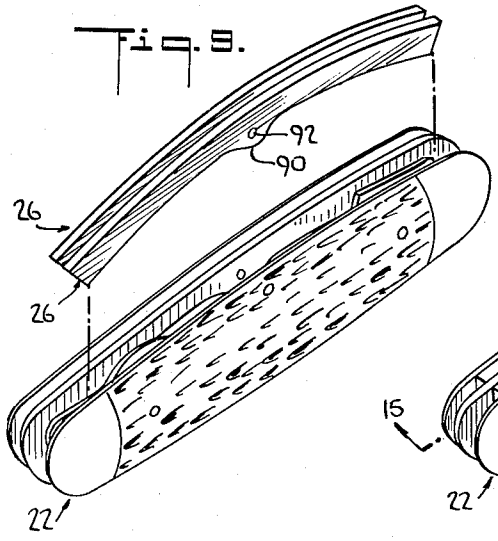


Fig. 9.

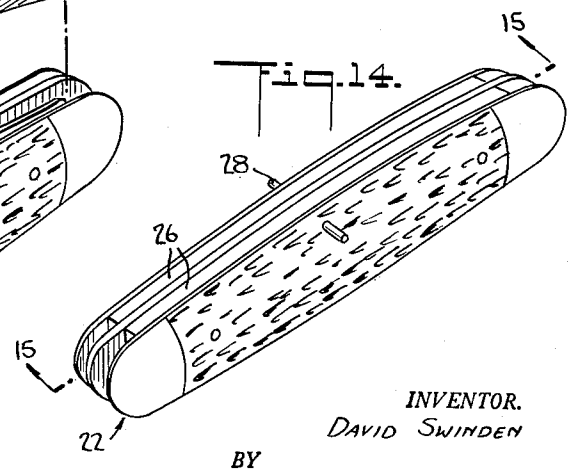


Fig. 14.

INVENTOR.
DAVID SWINDEN

BY

ATTORNEYS

United States Patent Office 2,977,678
Patented Apr. 4, 1961

2,977,678

POCKET KNIFE AND METHOD OF MAKING SAME

David Swinden, Walden, N.Y., assignor to Imperial Knife Associated Companies, Inc., Providence, R.I., a corporation of Rhode Island

Filed Jan. 6, 1960, Ser. No. 794

4 Claims. (Cl. 30—155)

This invention relates to a pocket knife and to a method of making the same.

More particularly, my invention relates to a knife of novel construction which reduces the cost of manufacture, lessens the time and skills required for assembly, eliminates certain assembly steps, and appreciably lowers the cost of the completed knife.

Heretofore a knife frame has constituted a rigid assembly of lining plates, back springs and blades which laboriously were put together, piece by piece, in a series of operations which were individually so delicate that they habitually have been performed by hand. Accordingly, manufacture of such knives was comparatively expensive and peculiarly responsive to increases in labor costs, not having heretofore been capable of automated refinements which increase a worker's output.

In addition, it has been customary up to the present invention, when using knives having solid bolsters, to assemble the bolster as a fixed part of the knife frame during the course of manufacture of the knife. That is to say, the bolster and bolster plates were not merely an ornamental covering for a knife frame, but were integrated with the frame during the manufacture of the latter. This led to several drawbacks. For example, it prevented the stockpiling of the frames per se, as subunits, and instead necessitated the stockpiling of completed knives of different types. Also, it required the use of expensive materials for the pivot pins, since the ends of the pins had to be flush with the exterior surfaces of the bolsters and had to exhibit the same surface characteristics. Moreover, it required a high finish to be given to the ends of the pivot pins so that they would blend into the bolsters and not be noticed.

It is the principal object of my invention to provide a knife and method of making the same which is not subject to the foregoing drawbacks.

More particularly, it is an object of my invention to provide a pocket knife having a new and unusual construction which is uniquely adapted to machine production and which can be adapted to automation.

It is another object of my invention to provide a pocket knife the construction of which is such that it includes a sub-assembly in the form of an incomplete knife frame which is adapted to be integrated in a final assembly step with back springs and bolster plates, the final assembly step being a particularly simple one that can be carried out by machine or by hand, but preferably by machine, in a short sequence of simple operations.

It is another object of my invention to provide a pocket knife which utilizes a novel connection between the bolster plate and the knife frame sub-assembly.

It is another object of my invention to provide a pocket knife wherein the connection between the bolster plate and the knife frame sub-assembly is internal and, therefore, concealed so that pivot pins of common metals can be used which do not have to be polished and finished to match the bolster.

It is another object of my invention to provide a novel

process for making a pocket knife of the character heretofore described.

Other objects of my invention in part will be obvious and in part will be pointed out hereinafter.

My invention accordingly consists in the features of construction, combinations of elements, arrangements of parts and series of steps which will be exemplified in the knife and process described hereinafter and of which the scope of application will be indicated in the appended claims.

In the accompanying drawings in which is shown one of the various possible embodiments of my invention,

Fig. 1 is a side view of a finished pocket knife constructed in accordance with and embodying my present invention;

Fig. 2 is a top view of said knife, the same being shown in not quite finished condition, in that the ends of the setting pin are shown untrimmed and unspun;

Fig. 3 is an exploded perspective view of the bolster unit utilized in said knife;

Fig. 4 is an inside perspective view of said bolster unit;

Fig. 5 is an enlarged fragmentary sectional view taken substantially along the line 5—5 of Fig. 4;

Fig. 6 is an exploded perspective view of the knife frame sub-assembly utilized in said knife;

Fig. 7 is a perspective view of said knife frame sub-assembly;

Fig. 8 is an exploded perspective view showing the knife frame sub-assembly and bolster units;

Fig. 9 is an exploded perspective view showing the bolster units mounted on the knife frame sub-assembly and the back springs separated therefrom;

Fig. 10 is a view similar to Fig. 9 but showing the setting pin in exploded position;

Fig. 11 is a reduced sectional view taken substantially along the line 11—11 of Fig. 10 and illustrating the initial arrangement of a back spring, a bolster unit and the knife frame sub-assembly before they have been manipulated preparatory to reception of the setting pin;

Fig. 12 is an enlarged sectional view taken substantially along the line 12—12 of Fig. 11 and illustrating the location of the pivot pins relative to the bolsters before the knife is ready to receive the setting pin;

Fig. 13 is a sectional view taken substantially along the line 13—13 of Fig. 10 and illustrating the relative positions of the back springs, the sub-assembly plates, and the bolster units before the knife is ready to receive the setting pin;

Fig. 14 is a perspective view of the knife after insertion of the setting pin;

Fig. 15 is a reduced sectional view taken substantially along the line 15—15 of Fig. 14 and illustrating the positions of the various parts of the knife after insertion of the setting pin; and

Figs. 16 and 17 are enlarged sectional views taken substantially along the lines 16—16 and 17—17, respectively, of Fig. 15, being similar, respectively, to Figs. 12 and 13 except for the change in position of the parts after insertion of the setting pin.

In general I accomplish the several objects of my invention by providing a knife frame sub-assembly including at least one plate having pivot pins at the opposite ends thereof, at least one of said pins functioning as a support on which at least one blade of any suitable sort is rotatably mounted. At least one end of each pin, and preferably both, is headed, i.e., enlarged. Moreover, pursuant to the invention the knife further includes at least one bolster unit, and preferably two, the same sometimes being known in the trade as cover units. Such unit constitutes a plate having bolsters secured on opposite ends thereof. The plate is provided with keyhole

slots near its ends which are adapted to be coupled with the heads of the pins on the knife frame sub-assembly, the bolsters being hollowed to accommodate the heads of the pins.

Furthermore, pursuant to my invention the knife frame sub-assembly is coupled to the cover units and at least one back spring is disposed at the back of the sub-assembly with at least one end thereof pressed against the shank of a blade mounted on a pivot pin. In idle, i.e., unconnected, position, when the spring is unstressed, an intermediate portion of the spring protrudes from the back of the sub-assembly, and the pins are located at the large ends of the keyhole slots. However, when the back spring is pressed, it forces the pins into the narrow ends of the keyhole slots, provides a proper pressure on the blade, and, furthermore, registers an opening in the spring with openings in the cover units and in the sub-assembly plate so that when a setting pin is inserted through these aligned openings, the various parts of the knife, to wit, the sub-assembly, the bolster units and the back spring, are firmly locked to one another.

Referring now in detail to the drawings, and more particularly to Figs. 1 and 2, the reference numeral **20** denotes a pocket knife constructed in accordance with my invention. The shape and ornamental appearance of said knife and the number and types of blades, as illustrated in said figures and subsequent figures, are purely exemplificative and are not to be construed as a limitation upon my invention. Said knife includes two bolster units **22**, one at each side of the knife, a knife frame sub-assembly **24**, a pair of back springs **26** (not shown in either of these two figures but clearly illustrated in several of the other figures which will be discussed hereinafter), and a setting pin **28**. These constitute all the basic components of a knife embodying my invention. The detailed constructions of said components will become apparent from the description which follows:

Referring to Figs. 3, 4 and 5, a bolster unit **22** includes an elongated bolster plate **30** made of rigid sheet material, as for example brass or steel, such as normally is employed for a lining plate or cover plate of a knife. The sheet material is comparatively thin since it should be relatively inconspicuous in a finished knife.

The bolster plate **30** is provided with several through openings for different specific purposes. More particularly, I form in said plate adjacent opposite ends thereof bolster mounting openings **32**. Located adjacent to and inwardly from each mounting opening, but still within the area ultimately to be coextensive with a bolster, is a keyhole opening **34**. Each keyhole opening includes an enlarged end and a narrow end, said opening being elongated in a direction transverse to the length of the bolster plate. Both keyhole opening are similarly oriented and disposed. In a symmetrical knife, i.e., one wherein blades are mounted to rotate about axes symmetrically located in the bolster plates, the keyhole openings are located with their closed narrow ends on the axis of symmetry of the knife, since said ends, as later will be seen, are at the pivot axes for the blades.

There also is included in the bolster plate **30** a third pair of openings **36**, these being designed to receive rivets (soon to be described) for securing the ornamental scale in place. Finally, there is provided a fourth opening **38** (hereinafter referred to as a "locking opening"), this desirably being somewhere near the center of the bolster plate and near the back edge of said plate, i.e., the edge which ultimately is to be located at the back of the knife. The broad surface of the bolster plate **30** which is visible in Fig. 3 is what I will call the inside surface thereof, that is to say, the surface which faces toward the interior of the knife. The openings **32, 36** are chamfered, i.e., undercut, on the inside surface of the bolster plate but not on the outside surface thereof.

Each bolster unit **22** further includes an elongated ornamental scale **40** which is fabricated from any suitable material and is ornamentally finished in any suitable manner, as for instance to impart the appearance of a stag handle. A typical material for the ornamental scale is a synthetic plastic, e.g., cellulose acetate butyrate. The longitudinal edges of the ornamental scale are shaped to coincide with the corresponding portions of the longitudinal edges of the bolster plate **30**. The ends of the ornamental scale preferably are straight and are perpendicular to the longitudinal axis of said scale. The ornamental scale is permanently and rigidly secured to the bolster plate in any convenient fashion, e.g., by cementing, but as shown herein by a pair of headed rivets **42** the shanks of which pass through openings **44** in the ornamental scale and through the openings **36**, being thereupon headed into the chamfered ends of the latter openings so as not to protrude beyond the inside surface of the bolster plate.

Finally, each bolster unit includes at each end thereof a metal bolster **46** of conventional outward appearance which preferably is formed by forging or die-casting. A straight edge of the bolster lies flush against a square end of the ornamental scale and the remainder of the periphery of the bolster coincides with the edges of the underlying portion of the bolster plate. The bolster is secured in a suitable manner to the bolster plate as, for instance, by welding, brazing, soldering or cementing, or, as shown herein, by riveting. Thus, I form each bolster on its undersurface with an integral protuberant pin **48** in proper position to extend through the opening **32**. After insertion of the pin in the opening the tip thereof is headed to lie within the chamfered space provided for it so that it will not protrude from the inside surface of the bolster plate. It will be observed that this bolster is what is known as a "solid" bolster in distinction to the sheet metal bolsters which have become popular in pocket knives.

Heretofore it has been customary to provide an opening in each bolster which usually was drilled after the bolster was formed and which registered with openings in the knife frame plate for receipt of a pivot pin on which the blades were rotatably mounted. Thereafter, the ends of the pivot pin were reduced to lie flush with the exterior surface of the bolster and ground, lapped and finished to form an ostensible continuation of the bolster surface so that it would be unnoticed in a finished knife. Moreover, in order to impart like finishes to the bolster and ends of the pivot pin, it has been customary to employ a pivot pin of the same material as the bolster, this being a more costly material than was structurally necessary so that the cost of the knife was increased. However, by using my new construction the solid bolster does not have to be pierced and the pivot pin does not have to extend through the bolster.

For the foregoing purpose the bolster is formed with a recess **50** in its undersurface which lies in back of the keyhole opening **34**, is at least as wide as the wider end of the keyhole opening, and is a little longer than said opening. The recess is shaped to accommodate the head of a pivot pin which pin is inserted through the wide end of the opening and thereafter is moved down to abut the narrow end of the opening. Accordingly, the recess is elongated in the same direction as the opening, that is to say, transverse to the length of the bolster plate.

The ornamental scale includes a through opening **52** in registry with the locking opening **38**.

A completely pre-assembled bolster unit **22** is shown in Fig. 4.

Referring to Figs. 6 and 7, the knife frame sub-assembly **24** includes a spacer plate **54** and a lining plate **56**. Conveniently, the two sub-assembly plates may be of identical contour. However, for spacing purposes the spacer plate **54**, sometimes hereinafter referred to as the "center plate," desirably is made from comparatively heavy sheet material, whereas the lining plate **56** is made from considerably thinner sheet stock, this too being nor-

mal practice. The contour of the two plates **54, 56** is standard. However, for completeness, it is pointed out that the plates are skeletonized versions of the contour of the knife. Thus, each plate includes a complete end **58**, that is to say, an end the profile of which matches the profile of the end of the finished knife. Between its two ends each plate simply constitutes a spine **60**, i.e., a comparatively narrow strip in one piece with and joining the ends. Near the center of the knife each spine is formed with an internally directed protuberance **62** which is pierced by a locking opening **64** that in a finished knife will be in registry with the locking openings **38** of the two cover units. The recesses provided by the cutting away of the two sub-assembly plates cooperate to define compartments for reception of the infolded knife blades.

Any suitable number of knife blades is included, it being understood that the construction herein shown, i.e., with two sub-assembly plates, is for up to six blades and, ordinarily, if more blades are to be used additional separator plates will be provided, these either being heavy or light in accordance with the shapes of the extra blades and the thickness desired for the knife. In the knife herein shown, I have illustrated four blades, each of these being entirely conventional. Specifically, these include a knife blade **66**, a reamer blade **68**, a can opener blade **70** and a combined screw driver and bottle-top lifting blade **72**.

All of the blades have their operative ends fashioned in accordance with the desired functions but utilize a like-shaped shank **74**, this being one that is standard in the art. The shank includes two substantially parallel and approximately straight edges **76, 78** joined at the free end of the shank by a rounded surface **80**. At the back edge of the shank, this being the edge which is located at the back of the knife when the blade is extended, the shank edge **76** terminates at a shoulder **82**. Such construction is usual and is provided in order that the end of a back spring may butt against such shoulder when the blade is opened whereby to prevent further opening movement. The shank also includes a pivot opening **84**.

The sub-assembly has two pivot pins **86** each longer than necessary to penetrate the various components of the sub-assembly.

To fabricate the knife frame sub-assembly, a pivot pin **86** is threaded through the opening **84** in the shank of one of the blades, e.g., the can opener blade **70**, then through a pivot opening **88** located in an end of the center plate **54**, then through the pivot opening **84** of another blade, e.g., the knife blade **66**, and finally through the pivot opening **88** of the lining plate **56**. The other pin similarly is threaded through pivot openings in the screw driver blade, the center plate, the reamer blade and the lining plate. Thereupon the pins which originally are provided with one end headed are headed at their opposite ends. Desirably, the heads of both ends of the pivot pins are made with substantially the same diameters and of about the same thicknesses so that they can be interchangeably accommodated in the keyhole openings **34** and recesses **50**.

The sub-assembly as thus prefabricated, i.e., made before a complete knife is finished, is "sloppy" as this term is employed in machinery description, that is to say, loose. The looseness resides in the too great operative length of the pins, i.e., their lengths between the inner surfaces of their heads at the opposite ends thereof. It will be appreciated that at each end of the sub-assembly the two frame plates **54, 56** and the two blades have a certain definite combined thickness which desirably is substantially the same at both ends of the knife. In a snug assembly the operative lengths of the two pivot pins would be just slightly in excess of such combined thickness, that is to say, in the order of one or two thousandths of an inch in excess of such thickness. However, in a knife frame sub-assembly embodying the present invention, the operative length of each pivot pin is considerably in excess of the aforesaid combined thickness. It exceeds said combined thickness by an amount equal to the combined thickness of the two bolster plates **30**. In other words, the operative length of each pivot pin is slightly in excess, e.g., about one or two thousandths of an inch in excess, of the combined thickness, in the present example, of the lining plate, the center plate, the shanks of two blades and the two bolster plates. The excess is just sufficient to enable the knife frame sub-assembly to be joined to the bolster units in a manner soon to be described. Before assembly this sloppiness prevents the unit from having a well-defined shape, and in combination with the absence of the back springs, enables the blades to dangle.

The back springs **26** can be seen in several of the figures as, for example, Fig. 9. One of these is used for each blade or pair of blades, a pair being considered two shank-aligned blades at opposite ends of the knife. Specifically, there is one back spring for the knife and reamer blades and another back spring for the can opener and screw driver bottle-top lifting blades. Said springs are standard, being of the bar type and made of resilient material, such as a high carbon steel tempered to impart the necessary springy quality. The thicknesses of the springs match the thicknesses of the shanks of the blades, and said springs are wide enough to provide the proper stiffness for exerting the requisite pressure on the shanks, as is customary. The lengths of the springs are such that they extend almost all the way from one end to the other end of the knife (see Fig. 15), this being usual, so that the ends of the springs bear against the shanks of the blades at opposite ends of the knife in the conventional fashion. At the center of each spring I provide an inwardly directed protuberance **90** in which there is formed a locking opening **92**. The back springs are arched when unstressed, i.e., bowed or curved, the bowing being in excess of the bowing present in said springs in a finished knife. The reason for this will become apparent hereinafter.

It will be appreciated that the assembly of the bolster unit and the assembly of the knife frame sub-assembly are simple operations which, with the aid of jigs, can be carried out quickly by automated mass production. Moreover, as soon will be seen, a pair of bolster units and a knife frame sub-assembly can be joined in an automated mass production operation so that by thus breaking up the manufacturing steps I have provided a new method of assembly as well as a new construction which method lends itself to modern low-cost rapid assembly. Moreover, this new method enables different kinds of bolster units to be prepared in advance and held ready for assembly and similarly allows different kinds of knife frame sub-assembly units to be prepared in advance. The knife frame sub-assemblies then can be joined to the different bolster units as orders require, thereby substantially reducing the numbers of kinds of knives that have to be held in stock by a manufacturer.

The final step of joining a knife frame sub-assembly and a pair of bolster units and the back springs is simple. By it the sub-assembly is tightened and at the same time permanently connected to the bolster units in a rugged and durable manner. More specifically, and referring to Fig. 8, I place a pair of cover units **22** on opposite sides of a knife frame sub-assembly **24** with the keyhole openings **34** registered with the heads of the pivot pins **86**. In particular, the large ends of the keyhole openings are registered with said pins, and the narrow ends of the keyhole openings are arranged to extend toward the front edge of the knife frame sub-assembly, all as shown in Fig. 8. Then the headed ends of the rivets are inserted into the large ends of the keyhole openings, and the back springs **26** are laid on the back of the knife, one spring being placed between the center plate **54** and the lining plate **56** and the other spring being placed between the

center plate 54 and one of the bolster plates 30. At this time, which will be referred to hereinafter as the initial state of final assembly, the positions of the parts at the ends of the knife are shown in Figs. 11 and 12, and the positions of the parts at the center of the knife are shown in Figs. 11 and 13. The over-all appearance of the knife is seen in Fig. 10.

Referring first to the positions of the parts at the ends of the knife at said initial stage, it will be seen that the heads of the rivets are in registry with the wide ends of the bayonet slots and that these heads are located in the recesses 50 on the outer sides of the bolster plates. The back edges of the center and lining plates 54, 56 are above the back edges of the bolster plates 30 and the back edges of the back springs are approximately in registry with the back edges of the center and lining plates. However, the ends of the back springs are slightly inwardly of the position they ultimately will take. This has been exaggerated in Fig. 11.

At the center of the knife at the initial stage of final assembly, the back edges of the center and lining plates likewise will be above the back edges of the bolster plates. Hence, the locking openings 64 in the sub-assembly plates will be above the locking openings 38 in the bolster plates. Furthermore, due to the high idle arch, i.e., bow or rise, of the back spring (at this time the back springs are not stressed since they simply lie in their indicated position), the locking openings 92 in said springs are above the locking openings 64 in the sub-assembly plates.

With the parts in the position just described, pressure is applied on opposite sides of the long edges of the knife as indicated by the arrows A, B in Fig. 11. The pressure A is applied to the front edge (the edge through which the blades open outwardly) of the bolster units, specifically the bolster plates. The opposing pressure B is applied to the back springs, more specifically to the centers of the back edges of the back springs, desirably substantially in line with the locking openings 92.

As a result of the application of these pressures, the parts of the knife frame now being assembled first will move to what I call the mid-stage of the final assembly, wherein the sub-assembly has been shifted with respect to the bolster units but the springs have not changed their position with respect to the sub-assembly. Since the positions at this time can be adequately described, I have not illustrated them in order to avoid undue multiplication of the drawings. At the ends of the knife the pivot pins 86 have been shifted to the narrow ends of the keyhole openings 34. Said narrow ends are wide enough to snugly admit the shanks of the pivot pins. The heads of the pins now are located lower in the recesses 50 which, however, are sufficiently wide to accommodate these heads. Obviously, in this position the two bolster units no longer can be pulled laterally away from the knife frame sub-assembly, but there is nothing yet except the aforesaid pressures to stop the bolster units from shifting with respect to the sub-assembly and eventually falling away therefrom. At mid-stage the back edges of the sub-assembly plates 54, 56 are in registry with the back edges of the bolster plates 30 over the full length of the knife so that the bolster unit locking openings 38 are in registry with the sub-assembly locking openings 64. However, the locking openings 92 in the back springs still are out of registry with the locking openings 38, 64.

The positions of the parts at the end of final assembly are shown in Figs. 15, 16 and 17, Figs. 15 and 16 showing the positions at the ends of the knife and Figs. 15 and 17 showing the positions at the center of the knife. The final pressure which is applied to advance beyond mid-stage does not affect the positions at the ends of the knife. However, it does depress the centers of the back springs and brings the locking openings 92 in the back springs into registry with the locking openings 38, 64 in the bolster plates and subassembly plates. It also slightly spreads the ends of the back springs, this movement being exaggerated in Fig. 15 as compared to Fig. 11.

At the end of final assembly, after all of the locking openings are in registry, the setting pin 28 is inserted therethrough as shown in Fig. 17. This holds the back springs under the tension imparted at the end of final assembly. Thereafter, the protruding ends of the setting pin are cut away, i.e., trimmed, and the remaining ends are spun to form heads which press against the ornamental scale 40.

It will be appreciated that with the arrangement above described the ends of the back springs press down against the pivot pins (through the blade shanks) forcing them into the narrow ends of the keyhole openings so that in the finished knife there are substantial forces preventing the pivot pins from riding up the keyhole openings to the wide ends thereof. Accordingly, the knife cannot come apart accidentally; it only can be disassembled by removal of the setting pin. Of course, if desired, the setting pin can be deliberately removed at the factory if for any reason too many of a particular type of knife are made and it is desired to separate the cover units from the knife frame sub-assemblies so as to re-use the units and sub-assemblies in conjunction with other components at a future time.

It thus will be seen that I provided a knife and process which achieve the several objects of my invention and are well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein described, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention I claim as new and desire to secure by Letters Patent:

1. A knife comprising a knife frame sub-assembly including a sub-assembly plate, a pivot pin transversely mounted on said plate with the ends of said pin on opposite sides of the plate, a knife blade having a shank pivoted on said pin, both ends of the pin being headed, a pair of cover units each including a cover plate having an elongated keyhole opening therein with a wide end and a narrow end, the wide end of the keyhole opening being sufficiently large to admit a head of the pin and the narrow end of the keyhole opening being sufficiently large to pass the shank of the pin and being narrower than a head of the pin, the heads of the pin extending through the keyhole openings in said cover plates, an elongated back spring having an end bearing on the shank of the blade, the longitudinal axes of the keyhole openings being transverse to the length of the spring and the wide ends of the openings being closest to the spring, each of said back spring, sub-assembly plate and cover plates having a locking opening therein, the locking opening in said back spring being spaced outwardly from the locking opening in said sub-assembly plate when the back spring is relaxed, said four locking openings being in registry, and a setting pin extending through said openings whereby said end of said back spring biases said pivot pin against the narrow ends of the keyhole openings.

2. A knife comprising a knife frame sub-assembly including a sub-assembly plate, a pair of pivot pins transversely mounted on said plate in spaced relationship and with the ends of the pins on opposite sides of the plate, a knife blade having a shank pivoted on one of said pins, both ends of both pins being headed, a pair of cover units each including a cover plate having a pair of elongated keyhole openings therein with a wide end and a narrow end, the narrow ends of both said keyhole openings being parallel and extending away from the wide ends in a direction transverse to the distance between the openings, the wide end of each keyhole opening being sufficiently large to admit a head of a pin and the narrow end of each keyhole opening being sufficiently large to pass a shank of a pin and being narrower than a head of a pin, the heads

of the pins on one side of the sub-assembly plate extending through the keyhole openings in the cover plate on one side of the sub-assembly and the heads of the pins on the other side of the sub-assembly plate extending through the keyhole openings in the cover plate on the other side of the sub-assembly, a back spring having an end bearing on the shank of the blade, the wide ends of the keyhole openings being closest to said spring, each of said back spring, sub-assembly plate and cover plates having a locking opening therein, the locking opening in said back spring being spaced outwardly from the locking opening in said sub-assembly plate when the back spring is relaxed, said four locking openings being in registry, and a setting pin extending through said four openings whereby said end of said back spring biases the pivot pins against the narrow ends of the keyhole openings receiving said pins.

3. A knife comprising a knife frame sub-assembly including a sub-assembly plate, a pivot pin transversely mounted on said plate with the ends of said pin on opposite sides of the plate, a knife blade having a shank pivoted on said pin, both ends of the pin being headed, a pair of cover units each including a cover plate having an elongated keyhole opening therein with a wide end and a narrow end, the wide end of the keyhole opening being sufficiently large to admit a head of the pin and the narrow end of the keyhole opening being sufficiently large to pass the shank of the pin and being narrower than a head of the pin, the heads of the pin extending through the keyhole openings in said cover plates, an elongated back spring having an end bearing on the shank of the blade, the longitudinal axes of the keyhole openings being transverse to the length of the spring and the wide ends of the openings being closest to the spring, at least a portion of the back spring being outwardly misregistered with the sub-assembly plate and cover plate when the back spring is relaxed, and means engaging said portion and said cover plates to maintain said portion, said sub-assembly plate and said cover plates in registry with the back spring stressed.

4. A method of making a knife comprising: providing

a pair of cover plates each having a pair of elongated spaced keyhole openings therein each having a wide end and a narrow end and arranged with the longitudinal axes of the keyhole openings parallel and transverse to the distance between said openings, providing a knife frame sub-assembly including a sub-assembly plate, a blade and a pair of pins one of which pivotally secures the blade to the sub-assembly plate, both pins having headed ends on opposite sides of the plate smaller than the wide ends of the keyhole openings and larger than the narrow ends of said openings with the shanks of said pins smaller than the narrow ends of said keyhole openings, providing locking openings in the cover plate and sub-assembly plate, providing an elongated back spring, inserting the heads of the pins into the wide ends of the keyhole openings, placing the back spring between the cover plates and bridging the space between the pins with the spring closest to the wide ends of the keyhole openings, providing a locking opening in the back spring which when the spring is located in its mentioned position and is relaxed is positioned outwardly from the locking openings in the sub-assembly plate and cover plates, shifting the sub-assembly plate with respect to the cover plates in a direction such as to force the pins against the narrow ends of the keyhole openings and to register the locking openings in the sub-assembly plate and the cover plates, then pressing the back spring with respect to the cover plates to bring the locking opening in the back spring into registry with the locking openings in the cover plates and sub-assembly plate, and finally inserting a member through all said locking openings.

References Cited in the file of this patent

UNITED STATES PATENTS

432,517	Dittert	July 22, 1890
870,413	Brown	Nov. 5, 1907
1,128,788	Joseph	Feb. 16, 1915
2,637,102	Vossler	May 5, 1953

FOREIGN PATENTS

227,823	Great Britain	June 25, 1925