United States Patent [19]

Hayes

[11] **3,922,783**

[45] **Dec. 2, 1975**

[54] **CUTTER EMPLOYING DUAL PAWL ACTION AND AUTOMATIC STOP AND RETURN MEANS**

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[73] Assignee: **Efficiency Tool Company**, Pelham, Ala.

[22] Filed: **Aug. 22, 1974**

[21] Appl. No.: **499,473**

[52] **U.S. Cl.** **30/250**; 30/193

[51] **Int. Cl.²** **B26B 13/26**

[58] **Field of Search** 30/249, 250, 261, 192, 30/193

[56] **References Cited**

UNITED STATES PATENTS

3,210,844	10/1965	Tontscheff	30/250

FOREIGN PATENTS OR APPLICATIONS

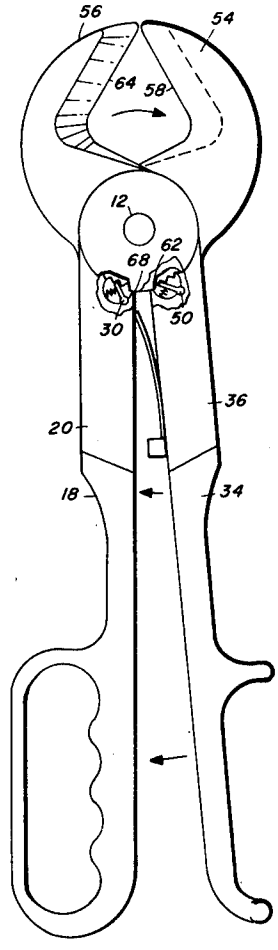
277,884	4/1965	Australia	30/249

Primary Examiner—James L. Jones, Jr.
Assistant Examiner—J. C. Peters
Attorney, Agent, or Firm—Duckworth, Hobby & Allen

[57] **ABSTRACT**

A cutter includes first and second handle assemblies each of which carries a respective cutting blade, the handles and blades having a common pivot axis. The cutter further includes a dual pawl arrangement, one of which prevents rotation of one of the cutting blades when the handles are moved apart, the other pawl providing rotation of that cutting blade when the handles are moved together. Means are also provided for limiting the rotation of the one cutting blade and returning that blade to the open position.

13 Claims, 5 Drawing Figures



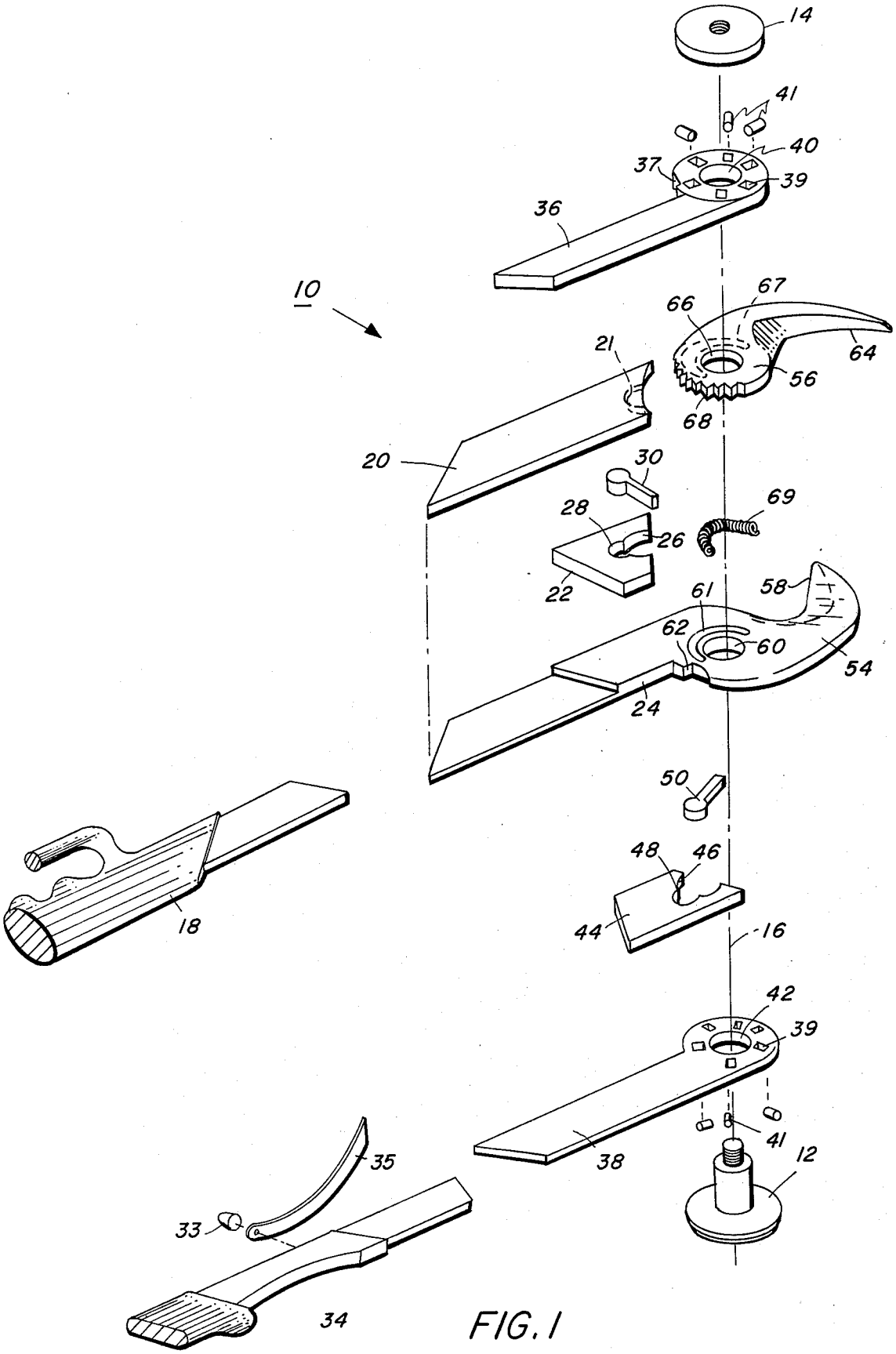

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FIG. 1

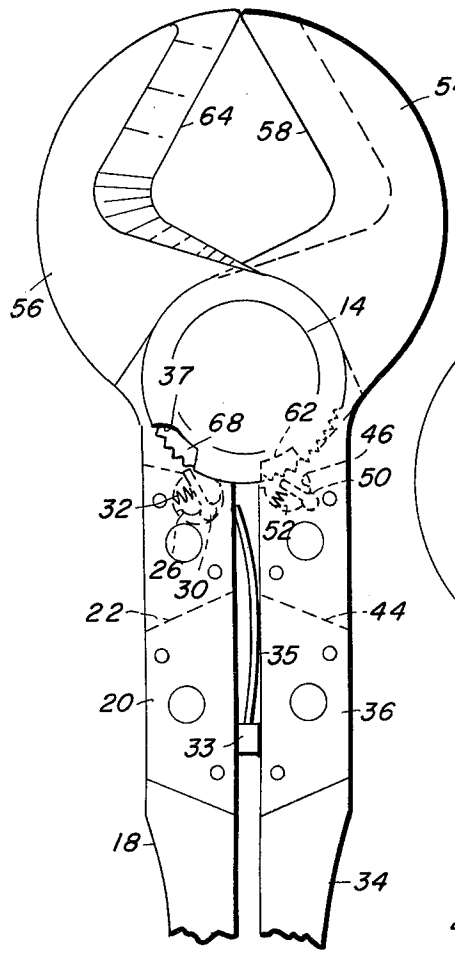
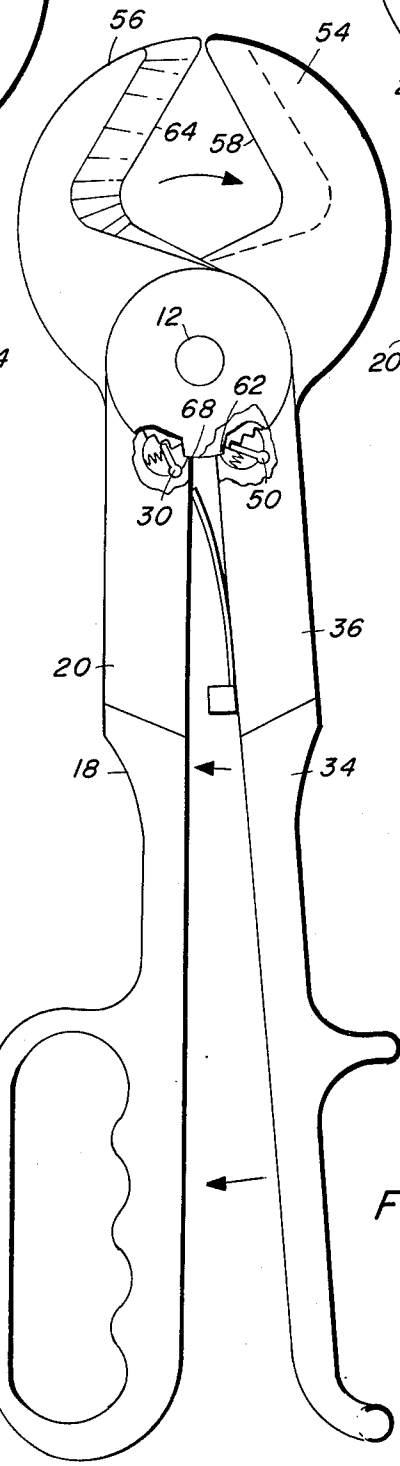


FIG. 2



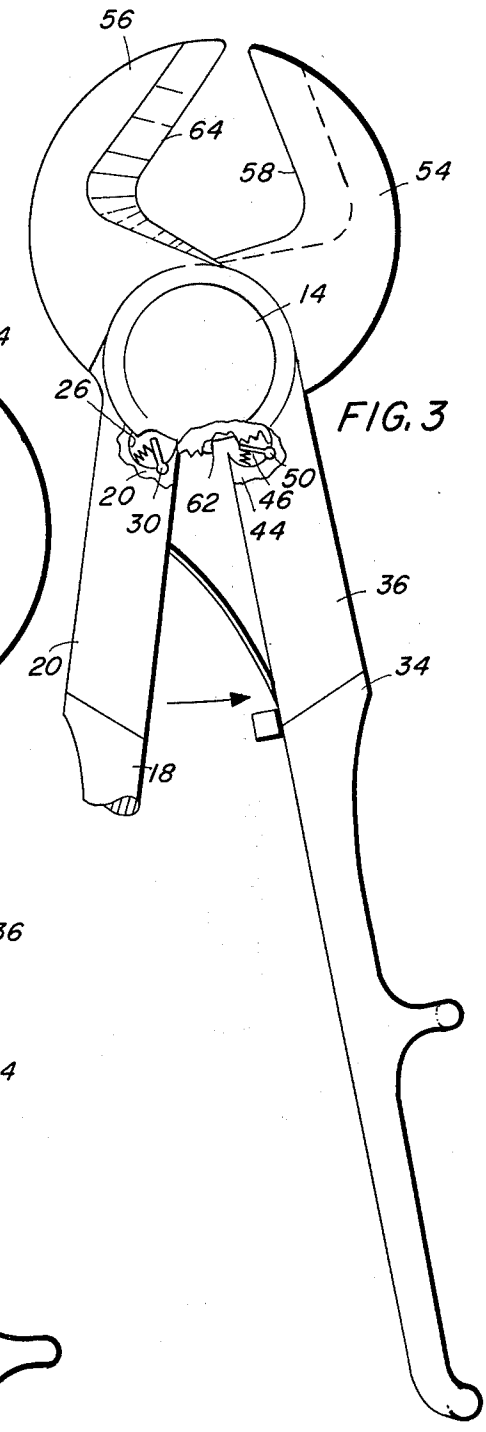


FIG. 3

FIG. 4

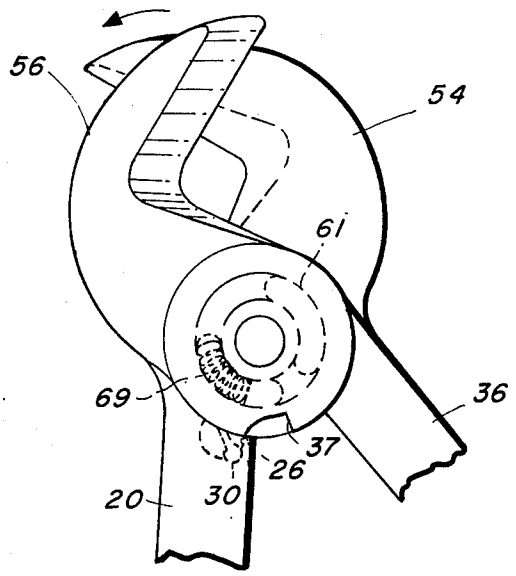


FIG. 5

CUTTER EMPLOYING DUAL PAWL ACTION AND AUTOMATIC STOP AND RETURN MEANS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to cutting devices, and in particular relates to cutters for cables and similar materials.

2. Description of the Prior Art

Cutting devices such as scissors, shears, snippers, cable cutters and the like employ a wide variety of designs, some of which are utilized for specific work functions.

In the cutting of cables of the type including a metallic element therein, it is generally necessary to provide a high mechanical advantage in order to overcome the tensile strength of the metal. To this end, basic cable cutter designs generally employ relatively long handles and short blade lengths. To this basic design has been added various compound motions and rachetting arrangements which allow the use of shorter handles. See for example U.S. Pat. No. 3,210,844 to Tontscheff which discloses cable cutting pliers having a dual rachetting arrangement and relatively short handles, the rachetting handle being pivoted at a point below the pivot point of the cutting blades.

Other prior art arrangements are shown in the following U.S. Pat. Nos.: 127,735 to Broadbrooks and 1,454,917, both of which disclose pruning shears; 3,243,880 to Weller and 1,317,758 to Dicop, both of which teach cutters employing a compound motion and a single rachetting arrangement.

In many cutters of the type employing rachets, the rachet is controlled by means which is easily accessible outside the tool. However, these arrangements are unsatisfactory in some cases, in that it creates an unsafe condition for the user of the tool.

In addition to the above considerations, a commercially viable cable cutter must be fabricated from relatively high tensile strength materials at an economically feasible cost.

Another consideration will respect to cutters for electrical cable and the like is that the operator may only have one free hand available to operate the tool. For such applications, it is necessary that the tool provide means for automatically opening the cutting jaws after the cutting operation is completed without requiring the operator to utilize his other hand.

SUMMARY OF THE INVENTION

The present invention contemplates cutting apparatus comprising a first handle assembly and a first cutting blade carried by the first handle assembly. A second cutting blade is superposed on, and has a common pivot axis with the first cutting blade. A second handle assembly having a common pivot axis with the first and second blades includes means carried thereby for rotating the second cutting blade when the first and second handles are moved together, to effect the cutting operation. Additional means are carried by the first handle assembly to prevent reverse rotation of the second cutting blade when the first and second handles are moved apart.

In a preferred embodiment, means are provided for defining a range of operation through a portion of the total throw between the two handle assemblies. In this preferred embodiment, means are also provided for limiting the extent of rotation of the second cutting blade and thereafter allowing the blades to be moved apart when the handles are moved outside the operating range.

An important aspect of the present invention is that a cutter fabricated in accordance therewith may be machined from low cost, high tensile strength flat metal stock materials in a commercially feasible manner.

THE DRAWINGS

FIG. **1** is an exploded perspective view of one embodiment of a cutting device in accordance with the present invention.

FIGS. **2**, **3**, **4** and **5** are top plan views, FIGS. **3** and **4** being partially cut away, of the cutting device shown in FIG. **1**.

DETAILED DESCRIPTION

A preferred embodiment of a cutting device in accordance with the present invention will initially be described with reference to FIGS. **1** and **2**.

The cutter, generally referred to as **10**, includes a hinge pin **12** and a hinge nut **14** which, when joined together, define a common pivot axis **16** for the handles and cutting blades of the cutter **10**.

The cutter **10** includes a stationary handle assembly and a rachet handle assembly, the stationary handle assembly comprising a stationary handle **18**, a face plate **20** and a retaining pawl plate **22** interposed between the face plate **20** and the shaft **24** of a first cutting blade, described below. The face plate **20** includes an indentation **21** on the inner surface thereof and opposite the retaining pawl, described below. The retaining pawl plate **22** includes a hole **26** in a surface thereof and a pawl bearing hole **28** communicating with the hole **26**. A retaining pawl **30** extends through the hole **26** and is rotatably fitted in the bearing hole **28**. The retaining pawl **30** has a greater thickness dimension than the retaining pawl plate **22** and thus extends into the indentation **21** of the face plate **20** when the cutter **10** is assembled. A retaining pawl spring **32** (shown in FIG. **2**) provides bias to the retaining pawl **30** in the hole **26**.

The rachet handle assembly includes a rachet handle **34** and front and rear hinge plates **36** and **38**, respectively. The front hinge plate **36** includes a slot **37** along the outer periphery thereof. Both hinge plates **36** and **38** include corresponding holes **40**, **42** therein through which the hinge pin **12** is fitted. Both hinge plates **36** and **38** further include a plurality of slots **39**, into which are positioned needle roller bearings **41** (only some of which are shown in FIG. **1**) to provide low friction surfaces between the hinge pin **12** and the hinge plate **38** and between the hinge nut **14** and the hinge plate **36**, and to further maintain the desired pressure between each of the hinge pin and hinge nut and the respective cutting blade adjacent thereto.

A locking pawl plate **44** is positioned between the front and rear hinge plates **36**, **38**, the locking pawl plate including a hole **46** and a bearing hole **48** therein similar to that described in reference to the retaining pawl plate **22** which comprises a portion of the stationary handle assembly. A locking pawl **50** extends through the hole **46** and is rotatably fitted in the bearing hole **48**. The locking pawl **50** is biased by a spring **52** (shown in FIG. **2**).

The cutter **10** further comprises a stationary cutting blade member **54** and a rachetting cutting blade member **56**. The stationary cutting blade member **54** in-

cludes the shaft 24, described above, which is preferably formed integrally with the stationary cutting blade and is fitted to the stationary handle 18 to thus form a portion of the stationary handle assembly. The stationary cutting blade member 54 further includes a cutting surface 58 and a hole 60 therein through which the hinge pin 12 is inserted coaxially with the holes 40, 42 in the respective front and rear hinge plates 36, 38. The stationary cutting blade member 54 further comprises a slot 62 having similar dimensions as the slot 37 in the front hinge plate 36, the slot 62 being positioned in the outer periphery of the stationary cutting blade member adjacent the toothed segment of the rachetting cutting blade member 56. Additionally, a circular slot 61 extends into the upper surface of the stationary cutting blade 54 and around the hole 60 therein. The slot 61 corresponds to a like slot 67 in the rachetting cutting blade, with a compression spring 69 being engaged in both slots 61, 67 when the two cutting blades 54, 56 are fitted together.

The rachetting cutting blade member 56 includes a cutting surface 64 adapted to cooperate with the cutting surface 58 and provides the desired cutting action when these two cutting surfaces are passed with respect to each other. The rachetting cutting blade member 56 further includes a hole 66 therein through which the hinge pin 12 extends, and a toothed segment 68 along the outer periphery thereof. As shown more clearly in FIG. 2, the toothed segment 68 of the rachetting cutting blade member 56 is positioned adjacent the slot 62 in the stationary cutting blade member 54, adjacent the slot 37 in the front hinge plate 36, and the pawls 30, 50 are positioned in each respective hole 26, 46 so as to engage the toothed segment such that rotation of the rachetting cutting blade member can only occur in a clockwise direction (as viewed from the top in FIG. 2) when the pawls are so engaged.

The cutter 10 further includes a stop 33 and a leaf spring 35 affixed along the inside of the rachet handle 34.

Operation of the cutter 10 will now be described with reference to FIGS. 3 and 4. Noting FIG. 3, a cable or similar material to be cut is placed between the cutting surfaces 58, 64 and the rachet handle 34 is initially moved away from the stationary handle 18 only to the extent that the slot 37 is adjacent the pawl 30, such that the pawl engages the toothed segment 68 and prevents rotation of the rachetting cutting blade member 56 in the reverse direction. The locking pawl 50 cams across one, or at most, two teeth of the toothed segment 68 within the confines of the slot 62. Thus, the retaining pawl 30, which is offset in the indentation 21, cooperates with the periphery of the front hinge plate 36 and the slot 37 therein to only engage the toothed segment 68 during that portion of the movement when the slot 37 is next adjacent the pawl. In this manner, the retaining pawl 30 defines an operating range of handle movement, the purpose of which will be more clearly described below with reference to the manner in which the jaws are moved apart after the cutting operation is completed.

Thereafter, as shown in FIG. 4, the rachet handle 34 is moved toward the stationary handle 18, causing the locking pawl 50 to engage one of the teeth of the toothed segment 68 at the front lip of the slot 62. Continued movement of the rachet handle 34 in the direction of the stationary handle 18 causes the locking pawl 50 to rotate the rachetting cutting blade member 56 until the stop 33 comes in contact with the stationary handle 18. During this movement, the retaining pawl 30 cams across the toothed segment 68.

The cutting operation is continued by successive movements within the operating range, as described above. During each successive movement, the spring 69 is further compressed within the slots 61, 67 as the rachetting cutting blade 56 moves across the stationary cutting blade 54. Noting FIG. 5, when the cutting operation is completed, the handles 18, 34 are opened to an extent outside of the operating range, thus disengaging the retaining pawl 30 and locking pawl 50 from the toothed segment 68 and relieving the spring 69 which returns the rachetting cutting blade 56 to an open position. It will also be understood from a review of FIG. 5 that the spring 69 and the associated slots 61, 67 provides means for limiting the rotation of the rachetting cutting blade in a clockwise direction (as viewed in FIG. 5), since the maximum compression point of the spring occurs at the ends of the slots 61, 67 and thus prevents further rotation in that manner.

As will be appreciated from the above description, a cutter in accordance with the present invention employs an arrangement whereby both handles and cutting blades are pivoted about a common axis and which employs a dual pawl and rachetting arrangement to achieve movement of one of the cutting blades with respect to the other, both the pawls being contained within the tool for safety purposes. Additionally, means are provided for limiting rotation of the rachetting cutting blade and returning that blade to an open position. Accordingly, the cutter 10 of the present invention may be easily operated with one hand during both the cutting and blade opening periods.

From a review of FIG. 1, it is also clear that the cutter of the present invention can be fabricated from high tensile strength flat stock materials in a commercially feasible manner.

It will be clear to those skilled in the art that the cutter of the present invention may be operated with one hand, since movement of the two handles toward and away from each other within the operating range is defined by the dimensions of the two slots 37 and 62, and such movements can be maintained with one hand. Once the cutting operation is completed, the blades are then released by simply allowing the handles to move apart so as to release both pawls 30 and 50.

I claim:

1. Cutting apparatus comprising:
a first handle assembly;
a first cutting blade carried by said first handle assembly;
a second cutting blade adjacent to, and having a common pivot axis with said first cutting blade;
a second handle assembly having a common pivot axis with said first and second blades;
first means carried by said second handle assembly for rotating said second cutting blade in one direction when said first and second handles are moved together; and
second means carried by said first handle assembly for preventing rotation of said cutting blade in a direction opposite to said one direction when said first and second handles are moved apart.

2. The cutter recited in claim 1 further comprising:
third means for providing an operating range of movement of said handle assemblies; and wherein

said operating range is defined by operation of said second means to prevent rotation of said second cutting blade in said opposite direction.

3. The cutter recited in claim **2** wherein said second means comprises:

a toothed segment about a portion of the periphery of said second cutting blade;

a first pawl carried by said first handle assembly; and wherein

said first pawl only engages said toothed segment to prevent rotation thereof in said opposite direction.

4. The cutter recited in claim **3** wherein said third means comprises:

said second handle assembly including a first hinge plate therewith adjacent to, and having a common pivot axis with said second cutting blade, the periphery of said first hinge plate overlapping said toothed segment and having a first slot therein; and wherein

said first pawl engages said toothed segment only in said first slot.

5. The cutter recited in claim **4** wherein said first means comprises:

a second pawl carried by said second handle assembly;

said first cutting blade including a second slot along the periphery thereof; and wherein

said second pawl engages said toothed segment only in said second slot.

6. The cutter recited in claim **4** further comprising:

a second hinge plate with said first and second cutting blades positioned between said first and second hinge plates;

each of said first and second cutting blades and said first and second hinge plates having a corresponding hole therethrough coaxial with said pivot axis;

a hinge pin extending through all of the holes of said cutting blades in said hinge plates;

a hinge nut fixed to the extremity of said hinge pin; and wherein

said cutting blades and said hinge plates are rotatable about said hinge pin.

7. The cutter recited in claim **6** further comprising:

said hinge plates each including a plurality of bearing holes extending therethrough;

a plurality of bearings, each of which is positioned in one of said bearing holes and between one of said hinge pin and said hinge nut and one of said cutting blades, each bearing having a greater transverse dimension than the one of said hinge plates associated therewith.

8. The cutter recited in claim **6** wherein both said pawls are contained entirely within said cutter.

9. The cutter recited in claim **2** further comprising fourth means for limiting rotation of said second cutting blade in said one direction.

10. The cutter recited in claim **9** wherein said fourth means further comprises means for rotating said second blade in said opposite direction when said handles are moved apart outside said operating range.

11. The cutter recited in claim **10** wherein said fourth means comprises:

said first cutting blade having a first circular slot around said pivot axis;

said second cutting blade having a second circular slot around said pivot axis overlapping said first slot;

a spring disposed in said first and second slots; and wherein

rotation of said second cutting blade in said one direction compresses said spring such that said spring rotates said second cutting blade in said opposite direction when said handles are moved apart outside said operating range.

12. Cutting apparatus comprising:

first and second handles;

a first cutting blade member having an opening therethrough and a flat, elongated shaft joined to said first handle;

a face plate overlying said shaft;

a first pawl plate positioned between said shaft of said first cutting blade member and said face plate;

a first pawl secured by said first pawl plate;

a second cutting blade member having an opening therethrough axial with said opening in said first cutting blade member, said second cutting blade member having a toothed segment along a peripheral portion thereof;

first and second hinge plates with said first and second cutting blade members positioned therebetween, said first and second hinge plates fixed to said second handle and having respective openings therein axial with said openings in said first and second cutting blade members;

a second pawl plate positioned between said first and second hinge plates;

a second pawl secured by said second pawl plate;

means for biasing said second pawl so as to prevent rotation of said second cutting blade member in one direction when said first and second handle assemblies are moved together; and

means for biasing said first pawl so as to prevent rotation of said second cutting blade member in a direction opposite to said one direction when said first and second handles are moved apart.

13. The cutter recited in claim **12** whereby said biasing means comprises:

a portion of the periphery of said first hinge plate overlapping said toothed segment and having a first slot therein, said first hinge plate peripheral portion and said first slot comprising means for allowing engagement of said first pawl with said toothed segment only in said first slot and only when said handles are moved apart; and

a portion of the periphery of said first cutting blade member overlapping said toothed segment and having a second slot therein, said first cutting blade member peripheral portion and said second slot comprising means for allowing engagement of said second pawl with said toothed segment only in said second slot and only when said handles are moved together.

* * * * *