Nov. 5, 1968 A. BRISKMAN ETAL 3,408,875

POWER-OPERATED TOOL

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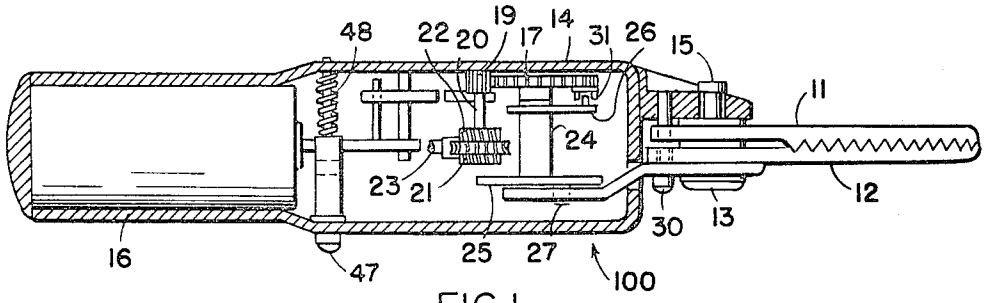

FIG.1

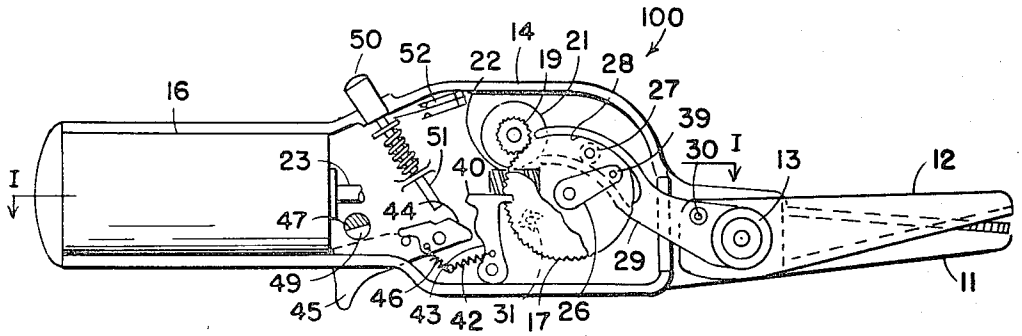

FIG.2

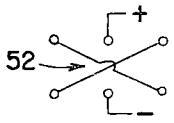

FIG.4

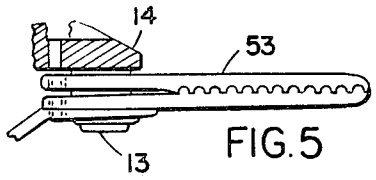

FIG.5

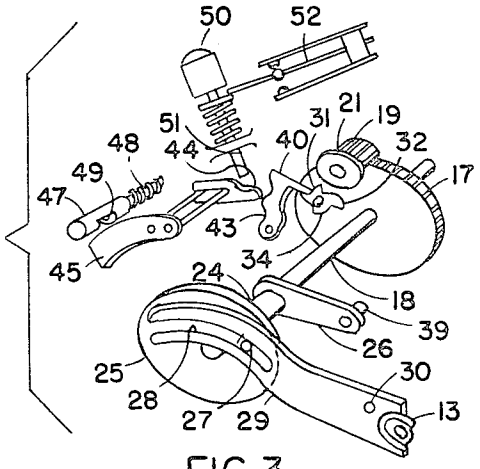

FIG.3

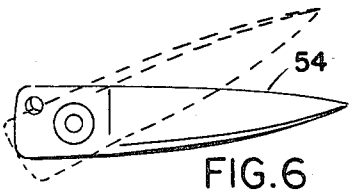

FIG.6

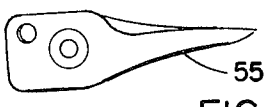

FIG.7

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FIG.8

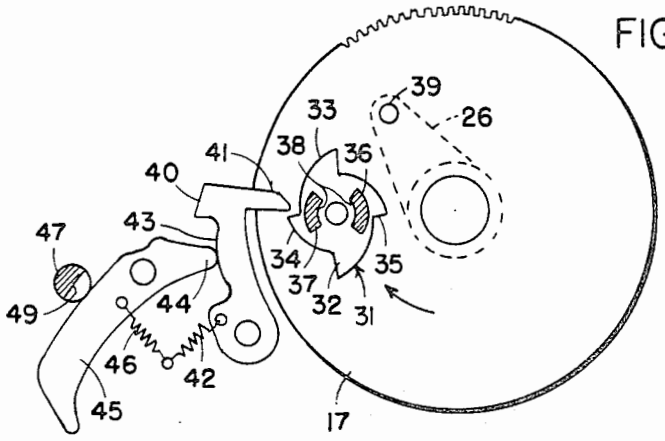


FIG.9

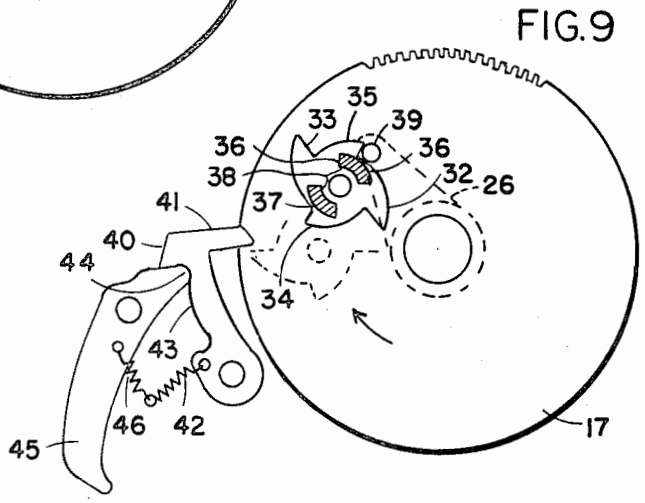


FIG.10a

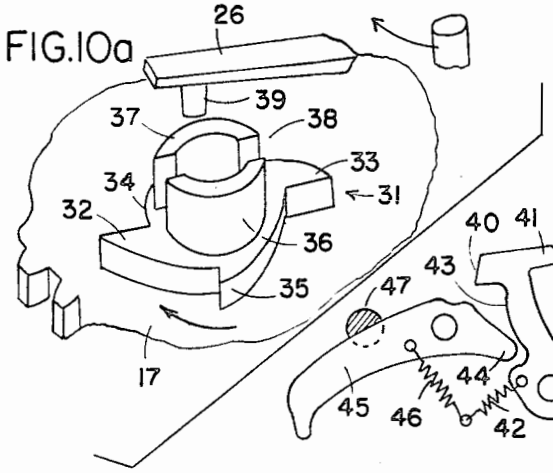
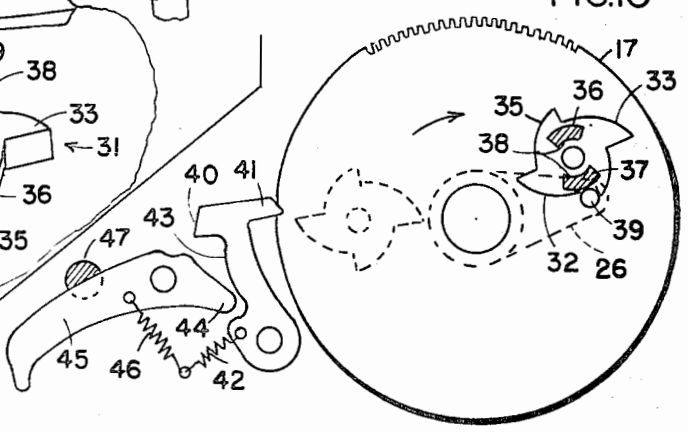


FIG.10



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POWER-OPERATED TOOL

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27 Claims. (Cl. 74—48)

ABSTRACT OF THE DISCLOSURE

Shears or like implements mechanically driven by an electric motor, a gear drive enclosed with the motor in a housing, which housing is also the handle, and a mechanism in the gear drive which may be set to cause the shear blades to move in a relatively shearing motion, continuously or intermittently, or cause them to stop temporarily, while the motor keeps running. A switch for reversing the running of the motor may be provided.

Background of the invention

The invention refers generally to power-operated hand tools, and particularly to power-operated shears, such as pinking shears, scissors, snips or the like tools which have two cooperating blades, one of which is stationary while the other performs a shearing intermittent or reciprocating motion to and from the stationary one. It is intended by this invention to create a versatile tool for improving operations which heretofore are performed by hand and which are known to be tiresome, hence slowing down after a certain time. No such motorized tools are known in the art.

Summary of the invention

The invention consist in such novel features, construction arrangements, combinations of parts and improvements as may be shown and described in connection with the apparatus herein disclosed by way of example only and as illustrative of a preferred embodiment. Objects and advantages will be set forth in part hereafter and in part will be obvious herefrom or may be learned by practicing the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

It is an object of the present invention to provide power-driven shears which are of a lightweight construction and can easily be operated with one hand.

It is a further object of the present invention to provide facilities for convenient exchange of a variety of cutting blades for various purposes.

Another object of the present invention is to provide a drive mechanism in power-driven shears which may be set, by a simple operation of a trigger lever, for various modes of operation.

Yet another object of the invention is to provide a power-operated shear which will operate with a shearing motion similar to hand operated shears.

The invention includes a selective intermittent motion device as a drive between two rotary motions on same axis or shaft, one above or adjacent to the other. The utilization of a curved slot provides controlled variable torque from a rotating driven stud due to difference in arcs of driving and driven members. This feature provides more drive power to the relatively reciprocating members, such as shear blades, as the cutting load moves to the tips of the blades, when added drive power is needed. According to an embodiment of the invention, the mechanically timed tool operates from a 24-volt transformer inserted along a line cord as a unit of the cord or its plug with the current being rectified into D.C.

The invention embodies the principle of the selective intermittent motion. A driving gear is provided upon which is rotatably mounted cam means having teeth. There is further provided a driven disk having a projection or pin. A trigger is placed in operating position for normal cycle with "cut, dwell, cut, dwell," etc. When the cam means associated with the drive means is in idle position, the cam does not engage the said pin. The cam has two oppositely disposed "high" teeth and two oppositely disposed "low" teeth. When the trigger is placed by the operator in a predetermined positioned it permits the cam to rotate ninety degrees for each revolution of the driving gear and will thus drive the pin on the driven disk. When the operator has released the trigger, the latter is now in position to engage only a "high" tooth as the cam comes by, rotating ninety degrees to "off" position after which all teeth will be free from the trigger. A limiting button is provided which is adapted to be pressed. When the cam is in position to drive the pin and mechanism is operating, the trigger is pulled to the limit, and a catch falls back so that no tooth can be reached and the operation is then continuous.

Various further and more specific purposes, features and advantages will clearly appear from the detailed description given below taken in connection with the accompanying drawings which form part of this specification and illustrate merely by way of example one embodiment of the device of the invention.

Brief description of the drawings

In the following description and in the claims, parts will be identified by specific names for convenience, but such names are intended to be as generic in their application to similar parts as the art will permit. Like reference characters denote like parts in the several figures of the drawing, in which:

FIG. 1 is a partial section of the device, taken along the line I—I in FIG. 2;

FIG. 2 is a side view of the device with the cover thereof removed and with some parts removed for the sake of clarity;

FIG. 3 is an exploded perspective view of the drive mechanism;

FIG. 4 is a schematic view of the drive reversing switch;

FIG. 5 is a partial section of an interchangeable pair of scalloping shear blades as shown;

FIG. 6 is a side view of an interchangeable pair of straight scissors blades;

FIG. 7 is a side view of an interchangeable pair of sheet metal snips;

FIG. 8 is a side view, partially in sections, of the mechanism for changing the mode of operation set for intermittent cutting operation;

FIG. 9 is a side view, partially in section, of the mechanism shown in FIG. 8 set for stopping the motion of the blades while the motor keeps running;

FIG. 10 is a side view, partially in section, of the mechanism shown in FIG. 8, set for continuous motion of the blades; and

FIG. 10*a* is a detail perspective of the cam wheel mounted on a gear driven by the motor shaft.

Description of the preferred embodiment

Referring now in more detail to the drawing illustrating a preferred embodiment by which the invention may be realized, there is shown in FIGS. 1 and 2 power-operated shears designated by the general numeral **100**. The shears therein depicted as pinking shears, by way of example, have a stationary member or blade **11** and a movable member or blade **12**, the latter being pivotally mounted on a stud **13**. Stationary blade **11** is fastened to a housing **14** by a screw **15**.

Housing **14**, which may be made of any suitable material, for example of aluminum, encloses the electric drive motor **16** and the operating mechanism which is driven by motor **16**, and which is constructed as follows: A gear **17** is fastened on a shaft **18**. Gear **17** is driven by a pinion **19** which is mounted on a short intermediate shaft **20** which also carries a worm-gear **21**. A worm **22** is mounted on a shaft **23** of motor **16**, so that worm-gear **21** is engaged and is driven by worm **22**.

A sleeve or hub **24** is arranged on shaft **18** adapted to freely rotate about shaft **18**. Sleeve **24** carries on the upper end thereof a disk **25**, and carries on the lower end thereof a lever **26**. Disk **25** has a cam follower roller **27**, mounted on a certain radius. Roller **28** engages a curved slot **28** of a plate or extension **29** which is fastened on movable blade **12** by a screw **30**. Thus, the kinematic chain comprised of disk **25**, roller **27**, slot **28** and plate **29** performs a slider-crank motion upon rotation of disk **25**, and consequently shear blade **12** is swingably moved about pivot stud **13**. A cam member or wheel **31** is rotatably located on gear **17**. Cam wheel **31** has two oppositely disposed long or high ratchet teeth **32**, **33** arranged 180 degrees apart from one another, and has two oppositely disposed short or low ratchet teeth **34**, **35** positioned at 90 degrees with respect to long teeth **32**, **33** as shown in FIGS. 8, 9 and 10. Two cam walls **36**, **37**, separated by a slot **38** are provided on a cam wheel **31**. Slot **38** is arranged in the direction of the center line drawn through long teeth **32**, **33**.

Lever **26** has a pin or like protrusion **39** projecting at a right angle over the end of lever **26**, at such radius that pin **39** may pass through slot **38** when cam wheel **31** is in the position shown in FIG. 8, or may be driven by either cam wall **36** or **37** when rotatable wheel or cam member **31** is in the position shown in FIG. 9.

A pawl lever **40** is pivotally located outside of gear **17**. Lever **40** has a finger **41** on the end thereof, which can be brought into engagement with long ratchet teeth **32**, **33** or with short ratchet teeth **34**, **35**, or may be withdrawn so that it may not engage any of the ratchet teeth. A spring **42** is attached to lever **40** for urging the latter continuously to disengaged or withdrawn position. At the rear of lever **40**, substantially opposite finger **41**, is a cam **43** which is engaged by the rounded nose **44** of a trigger **45**, which is pivotally mounted in housing **14**. A spring **46** is attached to trigger **45**, urging the latter into the position shown in FIG. 9, when it is not pulled.

An axially movable button **47** is located in housing **14**, under the force of a spring **48**, in such manner that it limits the stroke of trigger **45**, as shown in FIG. 8. However button **47** has a cutout **49**, by which trigger **45** may be pulled into an ultimate position, as shown in FIG. 10, when button **47** is pressed.

A second spring-loaded pushbutton **50** is provided which has a small stem **51**. When button **50** is pressed, stem **51** abuts against the back of trigger **45** and forces it into such position where finger **41** would not rotate cam wheel **31** because it would not contact the ratchet teeth. At the same time, an abutment of pushbutton **50** operates a microswitch **52** which is a reversing switch of the kind shown in FIG. 4. Thus, motor **16** may be reversed when the shear blades are jammed by an obstacle. Blades **11** and **12** can easily be exchanged with scalloping shear blades **53**, straight scissors blades **54**, metal snips **55**, or any other type of cutting blade. However, other use of the motorized tool could be made by simply exchanging the blades with other tools such as riveting prongs or the like (not shown in the drawing).

Operation

The operation of the power-operated shears may be described as follows: When the motor is switched on by any conventional switch, the trigger will be in the position as shown in FIG. 9. The cam on the cam wheel

drives, by means of the pin **39** on lever **26**, the disk **25** for one revolution and consequently for one cutting movement of the shear blades, until finger **41** touches one of the long pawl teeth **32**, **33** and indexes cam wheel **31** into the position shown in FIG. 8. Pin **39** now passes freely through slot **38**, and while the motor keeps running, the shear blade motion is stopped.

By pulling trigger **45** into such position as shown in FIG. 8, finger **41** of pawl lever **40** now contacts every one of the ratchet teeth **32**, **33**, **34**, **35**, thereby indexing cam wheel **31** through 90 degrees at every revolution of gear **17**. Thus alternatingly pin **39** is taken around by cam wall **36** or **37** whichever the case may be, and slides through slot **38**. Since lever **26** is integral with disk **25**, this disk is rotated only every second revolution of gear **17** and the shears are operated accordingly, stopping between cutting operations for giving the operator the chance to advance the shears for the next cut.

By pushing button **47** and pulling trigger **45** into cutout **49**, as shown in FIG. 10, pawl lever **40** is withdrawn entirely by spring **42** so that finger **41** no longer contacts any of the ratchet teeth of cam wheel **31**. Whichever wall, **36** or **37**, is in contact with pin **39**, will remain in contact therewith, and the motion of the shear blade becomes a continuous one.

The facility to reverse the direction of rotation of the motor to open the shears in case of jamming, has been described above.

While the invention has been described and illustrated with respect to a certain preferred example which gives satisfactory results, it will be understood by those skilled in the art after understanding the principle of the invention, that various other changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore to cover all such changes and modifications in the appended claims.

We claim:

1. Power-operated tool comprising a stationary member, a housing, a pivotally mounted movable member, said movable member being arranged for engagement with said stationary member, a motor, drive means connecting said motor with said movable member, cam means in said housing associated with said drive means, and means for indexing said cam means for imposing a reciprocating motion upon said movable member.

2. Power-operated tool according to claim **1**, and said stationary member being fixed to said housing.

3. Power-operated tool according to claim **1**, said motor being located in said housing.

4. Power-operated tool according to claim **1**, and at least one of said members being removable for replacement by another member.

5. Power-operated tool according to claim **1**, said drive means including an intermittent motion device cooperable with said cam means providing a drive between two rotary motions on a common axis one adjacent to the other.

6. Power-operated tool according to claim **5**, and an arcuate-slotted member connected to said movable member cooperable with said device providing controlled variable torque from said device to said movable member, said device being intermittently driven by said cam means.

7. Power-operated tool according to claim **5**, and an arcuate-slotted member connected to said movable member cooperable with a projection on said device providing controlled variable torque from said projection to said movable member, said projection being driven by said cam means.

8. Power-operated tool according to claim **1**, and said drive means including a driving gear, said cam means being rotatably mounted on said driving gear.

9. Power-operated tool according to claim **6**, and said drive means including a driving gear, said cam means being rotatably mounted on said driving gear.

10. Power-operated tool according to claim **8**, and

said cam means having two substantially diametrically opposed relatively long teeth and two substantially diametrically opposed relatively short teeth, said teeth being positioned substantially ninety degrees from each other, respectively, said cam means having spaced arcuate walls with a passage therebetween.

11. Power-operated tool according to claim **9**, and said cam means having two substantially diametrically opposed relatively long teeth and two substantially diametrically opposed relatively short teeth, said teeth being positioned substantially ninety degrees from each other, respectively, said cam means having spaced arcuate walls with a passage therebetween.

12. Power-operated tool according to claim **7**, and said cam means having two substantially opposite relatively long teeth and two substantially opposite relatively short teeth, said teeth being positioned substantially ninety degrees from each other, respectively, said cam means having spaced arcuate walls with a passage therebetween, said projection being engageable with said walls and with said passage.

13. Power-operated tool according to claim **10**, said cam indexing means comprising pivotal trigger means, a portion of which projects from said housing for engagement by an operator and pivoted lever means adapted to engage the teeth of said cam means, said lever means having a cam surface adapted to be engaged by said trigger means.

14. Power-operated tool according to claim **11**, said cam indexing means comprising pivoted trigger means, a portion of which projects from said housing for engagement by an operator and pivoted lever means adapted to engage the teeth of said cam means, said lever means having a cam surface adapted to be engaged by said trigger means.

15. Power-operated tool according to claim **12**, said cam indexing means comprising pivoted trigger means, a portion of which projects from said housing for engagement by an operator and pivoted lever means adapted to engage the teeth of said cam means, said lever means having a cam surface adapted to be engaged by said trigger means.

16. Power-operated tool according to claim **13**, and a releasable spring-loaded device located in said housing and projecting therefrom, said spring-loaded device constituting stop means for said trigger means controlling positioning of said lever means with relation to the teeth of said cam means.

17. Power-operated tool according to claim **14**, and a releasable spring-loaded device located in said housing and projecting therefrom, said spring-loaded device constituting stop means for said trigger means controlling positioning of said lever means with relation to the teeth of said cam means.

18. Power-operated tool according to claim **15**, and a releasable spring-loaded device located in said housing and projecting therefrom, said spring-loaded device constituting stop means for triggering means controlling positioning of said lever means with relation to the teeth of said cam means.

19. Power-operated tool according to claim **16**, and a releasable spring-loaded device located in said housing and projecting therefrom, said spring-loaded device constituting stop means for said trigger means controlling positioning of said lever means with relation to the teeth of said cam means.

20. Power-operated tool according to claim **16**, and a second releasable spring-loaded device located in said housing and projecting therefrom, said second device having a stem, said stem abutting said trigger means for holding the latter in a predetermined position, and reversing switch means operated by said second device for reversing the direction of rotation of said motor.

21. Power-operated tool according to claim **17**, and a second releasable spring-loaded device located in said housing and projecting therefrom, said second device having a stem, said stem abutting said trigger means for holding the latter in a predetermined position, and reversing switch means operated by said second device for reversing the direction of rotation of said motor.

22. Power-operated tool according to claim **18**, and a second releasable spring-loaded device located in said housing and projecting therefrom, said second device having a stem, said stem abutting said trigger means for holding the latter in a predetermined position, and reversing switch means operated by said second device for reversing the direction of rotation of said motor.

23. Power-operated tool according to claim **19**, and a second releasable spring-loaded device located in said housing and projecting therefrom, said second device having a stem, said stem abutting said trigger means for holding the latter in a predetermined position, and reversing switch means operated by said second device for reversing the direction of rotation of said motor.

24. Power-operated tool according to claim **1**, and said drive means comprising a shaft, a sleeve on said shaft, said sleeve freely rotatable on said shaft, a disk mounted one one end of said sleeve, a lever arm mounted on the other end of said sleeve, a pin at the end of said lever arm, a cam follower roller mounted on said disk, and a plate pivotally mounted on said housing together with said movable member, said plate having a curved slot, said follower roller engaging said slot for swingably moving said plate, and said movable member being attached to said plate.

25. Power-operated tool, according to claim **24**, and a gear fixedly mounted on said shaft, said cam means comprising a cam wheel rotatably mounted on said gear, cam walls on said cam wheel adapted to leave a passage therebetween, at least two relatively long ratchet teeth on said cam wheel, at least two relatively short ratchet teeth on said cam wheel, said long and said short teeth alternatingly arranged on said cam wheel, said cam walls driving said pin of said lever upon contact, said passage being wide enough to enable said pin to pass when said cam wheel has been indexed.

26. Power-operated tool, according to claim **25**, said cam indexing means comprising a pawl lever outside said gear, said pawl lever having a finger, said finger adapted to selectively intercept said long and said short teeth of said cam wheel, said pawl lever having a cam face on the side opposite said finger, a spring-loaded trigger, said trigger pivotally mounted in said housing, said trigger having a rounded nose, said nose engaging said cam face of said pawl lever, and a first releasable spring-loaded button located in said housing, said button constituting a stop for said trigger.

27. Power-operated tool, according to claim **26**, and a second releasable, spring-loaded button located in said housing, said second button having a stem, said stem abutting against said trigger for holding said trigger in a predetermined position, and reversing switch means operated by said second button for reversing the direction of rotation of said motor.

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