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Continuation-in-part of application Ser. No.
695,745, Jan. 4, 1968, now abandoned.

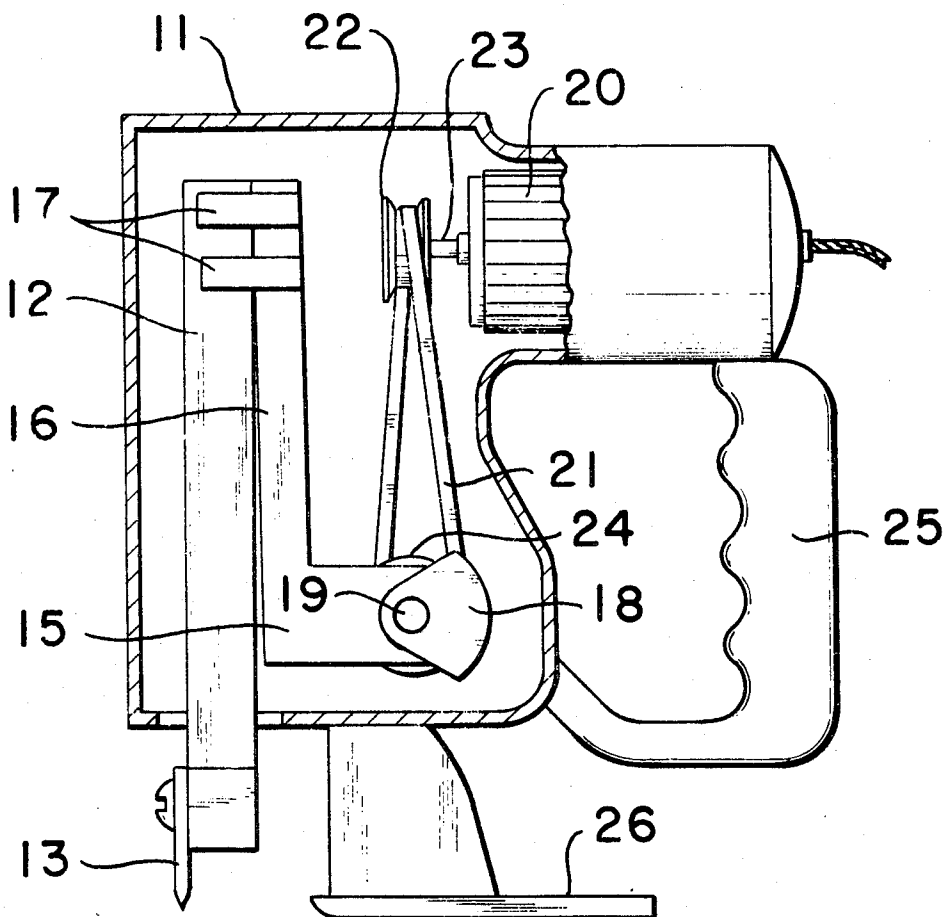
[50] **Field of Search**..... 15/93;
 30/169, 272; 173/49, 31; 299/37; 172/40

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[54] **SONICALLY DRIVEN PAINT SCRAPER**
8 Claims, 6 Drawing Figs.
 [52] U.S. Cl..... **173/31,**
 15/93, 30/169, 30/272, 173/49
 [51] Int. Cl..... **B26b 7/00**

ABSTRACT: An oscillator is coupled to a scraping blade by means of nonlinear resonant transmission means which is effective to convert sinusoidal oscillations from the oscillator into substantially unidirectional impulses at the scraper blade.



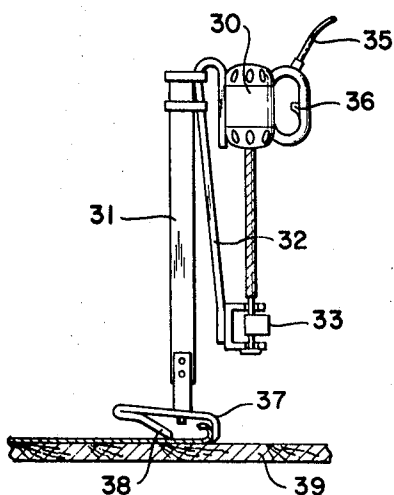


FIG. 2

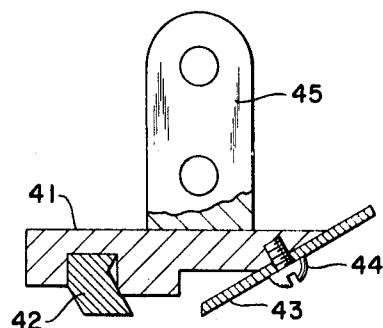


FIG. 3

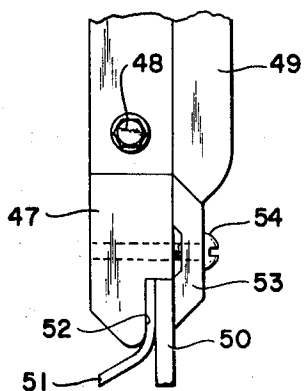


FIG. 4

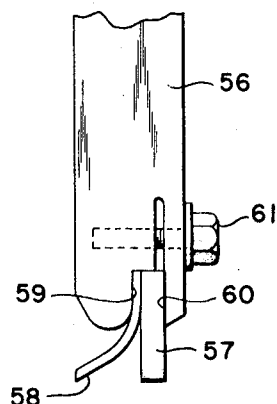


FIG. 5

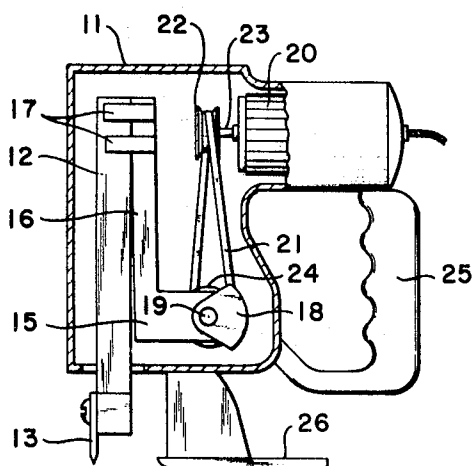


FIG. 1

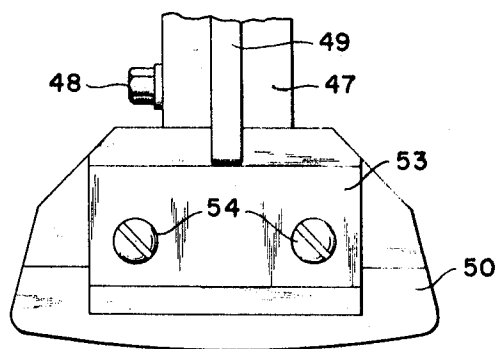


FIG. 6

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SONICALLY DRIVEN PAINT SCRAPER

CROSS REFERENCE TO RELATED APPLICATIONS

The present application is a continuation-in-part of my copending application Ser. No. 695,745, filed Jan. 4, 1968 and now U.S. Pat. No. 3,527,501.

BACKGROUND OF THE INVENTION

This invention relates to sonic tools and pertains more particularly to a sonic scraper having a sonically activated blade.

In my aforementioned application there is disclosed a nonlinear sonic trenching tool in which the oscillator is coupled by nonlinear spring means to the trenching tool in such a manner that oscillations of the oscillator are delivered to the trenching tool in a series of short, rapid impulses which drive the tool forward, with the energy from the oscillator being stored in the spring between the propelling impulses. This system provides a tool in which friction on the blade provides a back reaction which permits storage of propulsive impulse and causes the system to have a substantially unidirectional output. It has been found that a modified form of this nonlinear type of transmission system is very useful in some hand tools. For example, this modified system has been found to be useful in the powering of scrapers. Typically paint scrapers and the like have to be hand-powered because no means have been available for effectively applying a suitable motion to the scraping tool. The present invention however has been found to be very effective in applying a suitable motion to a paint scraping tool.

SUMMARY OF THE INVENTION

It is therefore a primary object of the present invention to provide a system for applying power to a scraping tool.

A further object of the present invention to provide a sonically active scraping tool which develops high chipping forces by means of the impact of the nonlinear resonant system while at the same time developing a minimum retarding impulse and therefore requiring minimum forward bias by hand pressure.

It is a further object of the present invention to provide a sonically activated scraping tool having substantially unidirectional output of the scraping tool thus avoiding the power loss associated with retrograde movement of the tool.

A still further object of the present invention is to provide an apparatus for converting a sinusoidal output of an oscillator to a substantially nonlinear or unidirectional output at the work tool.

A still further object of the present invention is to provide a sonic scraping apparatus that is substantially self-propelled. The above and other objects of the present invention are obtained by providing a sonic resonantly driven tool in which a sonic oscillator is coupled to a work tool by means of an elastic system having nonlinear response characteristics such that the almost sinusoidal output of a sonic oscillator is converted into a unidirectional impulse at the work tool.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the present invention will become apparent from the following specification when read in conjunction with the drawings in which:

FIG. 1 is a side elevation in section of a preferred embodiment of the present invention;

FIG. 2 is a side elevation of a second embodiment of the apparatus of the present invention;

FIG. 3 is a modified form of scraping tool for the present invention;

FIG. 4 is another modification of a scraping tool for the apparatus of the present invention;

FIG. 5 is a side elevational view of still another embodiment of a scraping tool for the present invention.

FIG. 6 is a front view of the apparatus of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings and more particularly to FIG. 1, there is illustrated housing means generally designated by the numeral 11, in which is suitably supported a work member 12 which is preferably an elongated substantially rigid member supported compliantly near its upper end in the housing 11. A cutting blade 13 is supported by the lower end of work member 12 and is adapted to engage a workpiece. A sonic oscillator 15 is operatively coupled, such as by means of an elongated elastic bar 16, to the work member 12. The elastic bar 16 is attached, such as by means of clamps 17 at its upper end, to stiff work member 12 and extends downward substantially parallel thereto. The oscillator 15 may be of any suitable type including an eccentric mass-type as illustrated in which an eccentric mass 18 is mounted on a rotatable shaft 19. The oscillator 15 may be driven by any suitable means, such as prime mover means 20, drivingly coupled to oscillator 15 by means of transmission means which comprises a flexible belt 21 interconnected by means of a sheave or pulley 22 on motor shaft 23 and a pulley 24 on driven shaft 19 of oscillator 15. Suitable support means in the form of an adjustable shoe 26 extends downward from the housing 11 for engagement with a workpiece to generally support the apparatus. A suitable handle or grip 25 extends from housing 11 for gripping and manipulating the apparatus.

In operation of the illustrated apparatus, sinusoidal oscillations generated by the oscillator 15 are converted by the system into an almost unidirectional impulse at the cutting blade 13. This will be apparent from an analysis of the operation of the system. Operation of the oscillator 15 which is supported by elongated member 16 cause these elements, oscillator 15 and elastic member 16, to act much like pendulum and to oscillate about a point in the vicinity of the clamp members 17 at the upper end of elastic member 16. As the pendulum-like structure oscillates or moves to the right, as viewed in FIG. 1, the elastic member 16 acts as a spring and stores up energy from the oscillator 15. As this pendulumlike structure attempts to swing through the center to the left, it comes sharply into engagement with rigid work member 12 and delivers a sharp blow thereto much like the blow of a hammer. The pendulumlike structure then bounces and is driven by the oscillator back to the right again storing energy on the backward stroke and delivering it again rapidly to the work members 12 as the pendulumlike structure attempts to swing back to the left. An analysis of the forces involved reveals that the oscillator 15 and elastic member 16 applies a long duration low-force to work member 12 as the oscillator and elastic member 16 moves to the right to store energy in the elastic member and propulsive impulse in the mass of the whole machine, and alternatively applies a very short duration high-force to the work member 12 as it impacts thereagainst in an attempt to move through the center to the left. The net result is that the net forces to the left on the system are sufficiently high to overcome resistances which are independent of velocity while those to the right are sufficiently low that they may be impeded by friction and thus the system may undergo a net movement to the left or forward on the work stroke.

Since this system must have reaction means to resist the back reaction from the oscillator on the backstroke, means have been devised which is adapted to engage the workpiece and improve the resistance to a backstroke of the blade and thus obtain a net forward motion. Such means are illustrated in FIGS. 2 through 6.

Referring now to FIG. 2 there is illustrated a second embodiment of my invention in which housing means 30 compliantly mounted on a work member 31 which is clamped to an elastic means or member 32 carrying an oscillator 33 which drives this system in the same manner as that described in FIG. 1. The oscillator 33 is driven by suitable flexible shaft 34 extending from a suitable prime mover which is supplied suitable power through conductor means 35 with a

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suitable control means 36. A work blade 37 is coupled to the lower end of work member 31 in any suitable manner. This work blade 37 incorporates ratchetlike means 38 which engages the work piece 39 and prevents the work member 31 and work blade 37 from undergoing a return stroke to the right after a work stroke to the left has been imposed thereon. This work blade 37 has ratchet means 38 engaging the work piece ahead of the blade 37 or cutting or scraping portion of blade 37 to prevent the blade or point of ratchet means 38 from digging into the workpiece 39 and marring the finish thereof.

Referring now to FIG. 3 there is illustrated an alternate form of work blade which comprises a body member 41 with a removable cutting blade 42 which may be held in place by any suitable means such as screws, not shown, and which may be removed and replaced. A removable ratchet means 43 which may be attached to body member 41 such as by screw 44 extends ahead of cutting blade 42 to engage the work piece ahead thereof. Suitable attaching means such as bracket 45 extends upward from body member 41 for attachment to a work member.

Another form of work blade is illustrated in FIGS. 4 and 6 in which a body member 47 is attached such as by means of screw 48 to a work member 49. A cutting blade 50 and ratchet means 51 extends into recess in the lower portion of body member 47 and is clamped against shoulder 52 by means of bracket 53 and screws 54. The embodiment illustrated in FIG. 5 comprises a work member 56 having clamp means formed in the end thereof in which a cutting blade 57 and a ratchet means 58 are clamped into the jaws 59 and 60 of the clamp member and held in place by means of a bolt or screw 61.

It can be seen from the above description that I have disclosed a sonic-powered scraping apparatus in which a blade supported by housing means is driven by a sonic oscillator which is coupled to a work member by means of the elastic transmission system which converts substantially sinusoidal oscillations of the oscillator into substantially unidirectional work strokes at the work blade for driving the work blade across the surface of a workpiece. The system includes alternate means cooperative with the workpiece to prevent a backstroke of the blade and thereby provide reaction for propulsion of the apparatus across a workpiece.

I claim as my invention:

1. A sonic scraping apparatus, said apparatus comprising:
 - housing means;
 - a blade-supporting member supported by said housing;
 - a scraping blade carried by said supporting member for a work stroke and disposed to engage a surface of a workpiece;
 - an alternating force oscillator;
 - elastic transmission means operatively supporting said oscillator on said housing for oscillator movement substantially in the plane parallel to that of said work stroke; and,

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said elastic transmission means being effective to transmit intermittent, short duration high forces to said scraping blade in the direction of said work stroke to produce a series of intermittent work strokes and to transmit intermittent long duration low forces to said scraping blade in the opposite direction to store energy and impulse between said work strokes.

2. The apparatus of claim 1 wherein:

said supporting member comprises a vertically disposed elongated rigid member supported at one end from said housing means and supporting said blade for a work stroke transverse to the longitudinal axis of said scraping supporting member.

3. The apparatus of claim 2 wherein:

said elastic transmission means comprises an elongated elastic member disposed adjacent to and substantially parallel to said supporting member;

said elastic means being operatively coupled at one end to said supporting member and carrying said oscillator at the other end.

4. The apparatus of claim 1 including:

means cooperative with said workpiece to prevent a backstroke of said blade.

5. A sonic scraping apparatus, said apparatus comprising:

housing means;

adjustable support means operatively connected to and extending from said housing for engagement with a workpiece;

an elongated substantially rigid work member depending from said housing means and supported thereby for a work stroke transverse to the longitudinal axis of said work member;

a work blade carried by one end of said work member and adapted to engage a workpiece;

an oscillator;

an elongated elastic member disposed adjacent to and extending substantially parallel to said work member;

said elastic member supporting said oscillator for oscillation within the plane parallel to said work stroke and operatively coupled to said work member for delivery of periodic short duration high forces to said work member in the direction of said work stroke to thereby impose said work stroke on said work member and to impose long duration low forces thereto between said work strokes to thereby store energy and impulse for said work strokes.

6. The apparatus of claim 5 wherein said work member includes ratchet means adapted to engage said workpiece and prevent a backstroke of said blade.

7. The apparatus of claim 6 wherein said ratchet means engages said workpiece ahead of said work blade.

8. The apparatus of claim 6 wherein said ratchet means engages said workpiece behind said work blade.