Feb. 1, 1944. W. F. OBEAR ET AL 2,340,553

ABRASIVE CUTOFF MACHINE

Filed April 9, 1943 2 Sheets-Sheet 1

Fig. 1.

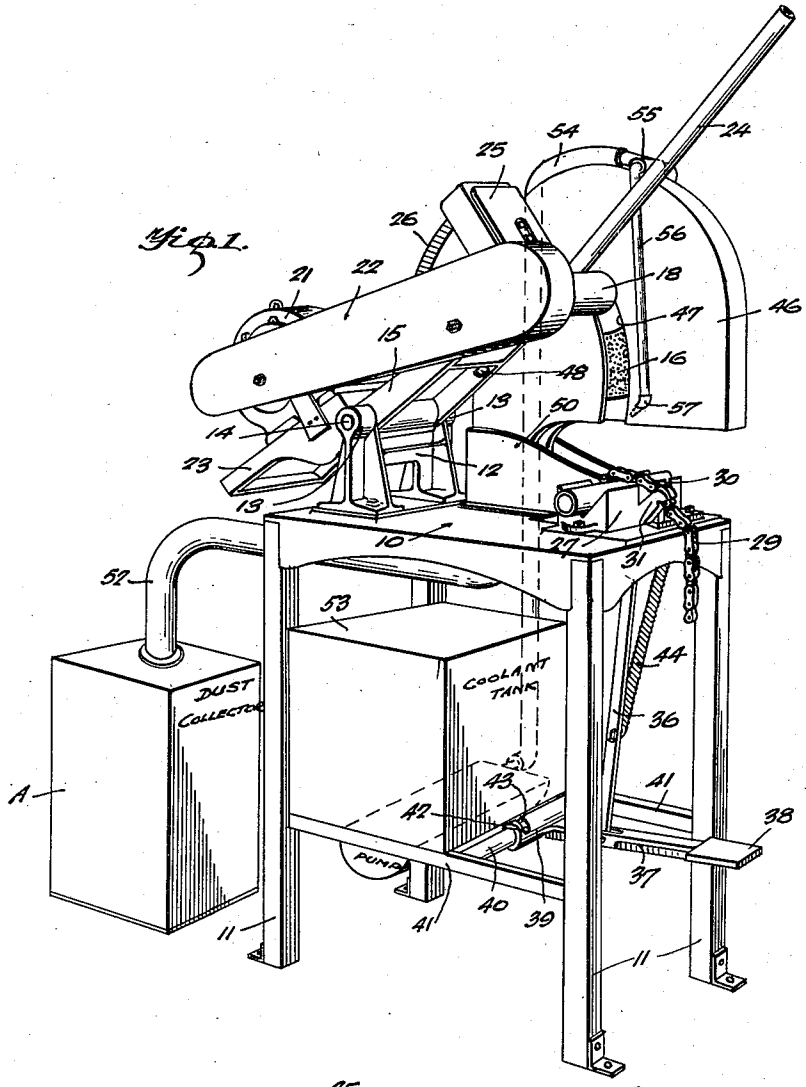
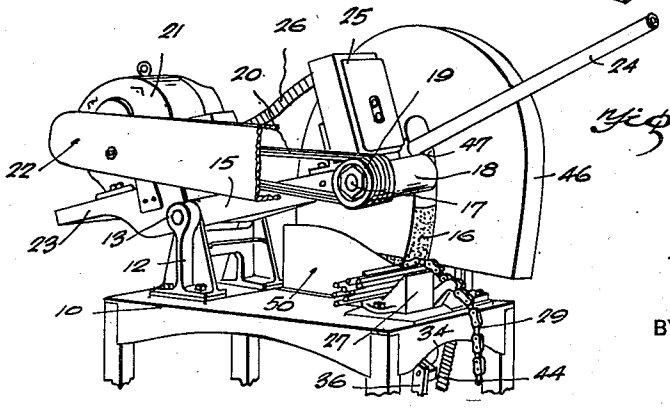


Fig. 2.



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Fig. 3.

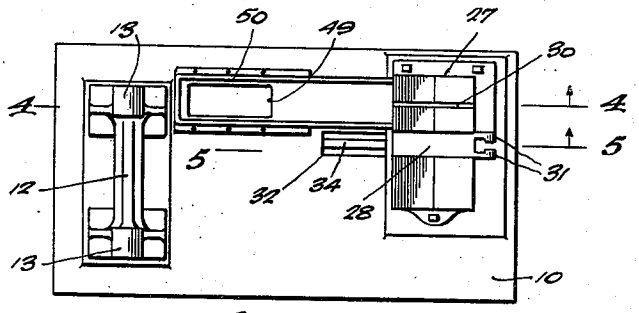


Fig. 4.

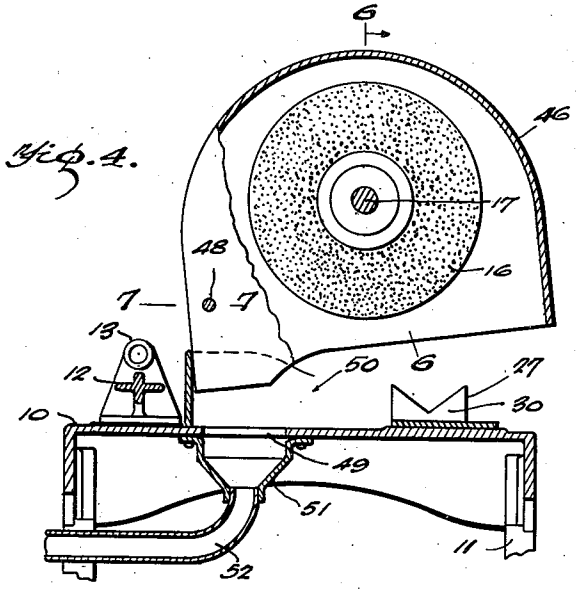


Fig. 7.

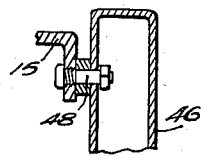


Fig. 5.

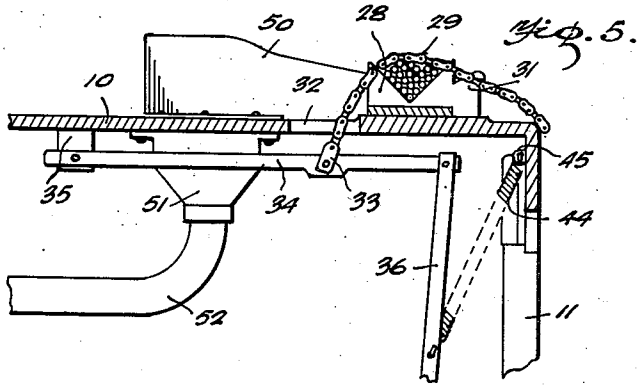
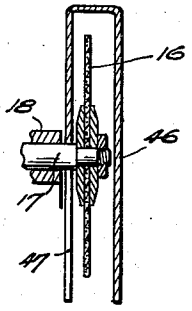


Fig. 6.



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ABRASIVE CUTOFF MACHINE

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8 Claims. (Cl. 51—98)

The present invention relates particularly to what are commonly known as abrasive cut off machines in which a thin abrasive cutting disc on a motor driven spindle, is mounted in connection with a manually operated vertically swingable frame, for vertical movement under manual control, to and from work held in a work clamp on a work table. Such machines may be efficiently utilized to quickly cut off work through the abrasive action of the rapidly rotating abrasive disc.

Machines of the above general character are well known and are now in wide and general use, but it is also known that they are faulty and lacking in certain respects from the standpoint of safety, not only as regards protection of the operator from direct accidental contact with the cutting disc, but also from dust and sparks.

It is true that some machines are now provided with water feeding arrangements and are for this reason known as wet cut off machines, but the wetting arrangements of such as are known are faulty in their interference with free access to the work clamping means.

Various vise-like work clamps are used in machines of this type, but here again they are objectionable, due to the lack of a clamping means by which the work may be held against possibility of shifting relative to the abrasive disc. The discs, being thin, are readily broken by work displacement during the cutting operation.

It is therefore the primary object of the present invention to provide certain improvements, in machines of the foregoing type, designed to promote safety both as regards direct contact with the disc and from dust accumulating and flying during the cutting operation, where the machine is used for dry cutting; to provide an effective feed of water or other coolant, where the machine is used as a wet machine, without in any way interfering with access to the work clamps, and to insure secure and non-shifting clamping of the work whether the latter consists of a single or multiple pieces.

With the foregoing general statement and objects in mind, further and more specific objects as well as the resulting advantages thereof, will clearly appear in the course of the following detailed description of the best mode thus far devised for carrying the invention into practical effect. In such description reference is made to the accompanying drawings, forming a part of this specification, and in which,

Figure 1 is a perspective view of the complete machine as improved herein, showing the swing frame in normal position with the cutter inactive.

Figure 2 is a similar view, somewhat reduced, with the dust collecting and water feeding arrangements eliminated, showing the swing frame lowered and the cutting disc fed into the work.

Figure 3 is a top plan view of the table and the parts attached thereto, with the swing frame and its parts removed.

Figure 4 is a vertical longitudinal sectional view, taken substantially on line 4—4 of Figure 3, also showing the cutting disc and its guard.

Figure 5 is a partial vertical longitudinal sectional view taken substantially on line 5—5 of Figure 3, showing the work clamping connections, and

Figures 6 and 7 are detail sectional views through portions of the cutter guard, taken respectively on lines 6—6 and 7—7 of Figure 4.

Referring now to Figures 1 and 2, and for the purpose of the present improvements, a table 10, supported on corner legs 11, is provided at the rear portion of its upper face with an upstanding transversely disposed pedestal 12, securely fastened thereto in any suitable manner, and having upper laterally spaced bearings 13 in which are journalled trunnion shafts 14 intermediately of the sides of the swing frame 15.

The above cutting disc 16 is shown clamped upon one end of its spindle 17 which is journalled through a bearing cross head 18 at the forward end of the swing frame 15. At the other end thereof, the spindle 17 is shown as having a multi-grooved pulley 19 which is connected by multiple belts 20 with a similar pulley on the shaft of a motor 21. The belts 20 and the spindle and motor shaft pulleys are normally covered by a guard 22 which is detachably connected to the adjacent side of the swing frame 15.

The motor 21 is securely, though adjustably, mounted on a motor platform 23 constituting the rear integral end of the swing frame 15, rearwardly of the fulcrum of said frame in the bearings 13 of the pedestal 12, and co-acts with said platform to normally overbalance the swing frame in a rearward direction and thus normally maintain the frame in a forwardly and upwardly inclined position in disuse, as seen in Figure 1. In use the forward portion of the swing frame is lowered to effective cutting position under manual operation and control, by virtue of an operating handle or bar 24, which is suitably fixed to the forward or cross head end of the frame so as to project upwardly and forwardly therefrom within convenient reach of the operator.

The operation of the motor 21 may be controlled through an off and on switch 26 shown as mounted above and upon the forward portion of the swing frame 15, a cable connection 26 being extended rearwardly from this switch 25 to the motor. Current supply connections may lead to the motor from any suitable source and have not been shown.

It is usual, with machines of the foregoing type, in which many of the features thus far described are conventional, to employ a vise-like work holder on the table 10 at its forward portion beneath the cutting disc 16, but slight imperfections on the surface of the work often prevent secure holding therefrom and insecurity of the work, which permits it to shift angularly, frequently results in a broken cutting disc. To avoid this disadvantage, a work holder is proposed in the nature of a V-block 27 which is solidly seated on, and bolted to, the table, though it is to be understood that it may be adjustable with respect thereto and hence with respect to the cutting disc 16.

The work holding block 27 has a channel 28 through its upper central portion to receive a work gripping flexible member or chain 29 and is also provided with a transverse slot 30 at a point between the channel 28 and one end of the block, into which slot the cutting disc 16 descends, when the swing frame is lowered, to thus engage the work securely gripped in the upper lengthwise V-groove thereof, by the chain 29.

The outer or forward end of the chain 29 is free to be adjustably engaged beneath forwardly and upwardly inclined hook members 31 which are preferably integral parts of the block 27 at opposite sides of the central channel 28, so that various forms of link chain may be employed. At its inner or rear end the chain 29 extends downwardly through, at opening 32 in the table 10, as best seen in Figure 5 and is attached, by any suitable shackle connection at 33, to a point intermediate the ends of a pull bar 34. This pull bar is disposed lengthwise beneath the table and pivoted at its rear end to a table lug or lugs 35, so that it may swing downwardly and thus pull the work gripping chain 29 tightly upon and across the work whether the latter be a single piece as in Figure 1 or a plurality of pieces as in Figures 2 and 5.

At its forward end the pull bar 34 is pivotally connected to the upper end of a connecting bar 36 whose lower end is pivotally connected as in Figure 1 to a treadle bar 37 intermediate the ends of the latter. The forward end of treadle bar which projects forwardly of the table 10 between the front legs 11, carries a treadle or foot plate 38 and its rear end has a tubular cross head 39 rotatable on a cross member 40 of the table frame and preferably fixed in connection with, and between, lengthwise side rails 41 connecting the front and rear legs 11 at each side of the table frame. Rotation of the cross head 39 of the treadle may be limited to limit upward swinging movement of the treadle, by a pin 42 fixed in the cross member 40 and projecting into a slot 43 circumferentially of the cross head, to thus maintain the treadle plate in a convenient position to which it is elevated in disuse by a retractile spring 44. The lower end of this spring is engaged with the connecting bar 36 and its upper end is anchored in a forward table lug 45.

There is also featured in the present invention a guard or hood 46 for the abrasive cutting disc 16, commonly rigidly attached to the swing frame and exposing the lower portion of the disc to at least its cutting depth, and hence but partially or imperfectly guarding the operator. To increase the safety factor and for another purpose which will presently appear, the invention proposes a cutting guard or hood which depends substantially below the cutting disc in the raised position of disuse and has in its inner wall an arcuate slot 47 which receives the spindle 17 and thus permits of relative downward swinging of the cutting disc 16, in use, to complete the cutting operation, after the lower forward portion of the guard 46 has been arrested by its contact with the work clamp 27. For this reason the guard 46 is, in the present instance, pivotally connected, by a pivot member 48, at its lower rear portion to the adjacent side of the swing frame 15, as plainly seen in Figures 1, 4 and 7. Thus, when arrested in its downward movement by the work clamp, the guard 46 may yield pivotally on the member 48.

After a cutting operation has been completed and the operator releases handle 24 to permit the forward portion of the swing frame to move upwardly, the cutting disc usually remains in speedy rotation for the reason that it is not cut off at the switch 25 until after restoration thereof to the position of disuse of Figure 1. Even if previously cut off, it is still in rotation, due to inertia, and in either event it is the time when accidents are most likely to occur. In the present construction the initial upward movement of the cutting disc 16 with the swing frame, carries the disc upwardly into the guard or hood 46 until the spindle strikes the upper end of the guard slot 47 whereupon the guard 46 then moves upwardly with the disc and is in a position completely covering the same.

Another feature of the yieldable guard is that its stroke of movement is relatively short as compared to that of the cutting disc and swing frame so that its rear lower portion may be effectively joined in suitable association with the table 10 to form a dust flue at the rear of the work holder or clamp, it being understood that, as viewed in Figures 1, 2 and 4, the cutting disc 16 rotates during the cutting operation in a clockwise direction.

In furtherance of the above, a dust exhaust opening 49 at the rear of the slotted cutter entering portion of the work clamp 27 is surrounded on three sides by an upwardly opening exhaust chute 50 which upstands from the table a sufficient distance to movably receive the lower rear portion of the guard 46 in any position of the latter. This chute is closer at its rear and has sides which extend forward to the work clamp so that it cooperates with the lower rear portion of the guard 46 at all times. Thus when the guard is in lowered position and the cutter is in operation, the guard forms with the chute 50 substantially a closed channel for the flow of dust to the exhaust opening 49.

While the dust may be permitted to merely drop into any suitable receptacle below the table 10, we may secure to the table, beneath opening 49, a funnel 51 from which a dust exhausting pipe or flue 52 may lead to a suction dust collector A of which there are many types now in practical use for dust collection from grinders and similar dust producing machines.

In some instances it may be desired to use the present cut off apparatus as a wet machine, and we may use a water or coolant tank 53 supported in the table frame as seen in Figure 1. With such a tank, a pump will be employed to supply

water or liquid to the work through a flexible hose and the like 54. It is proposed herein to connect hose 54 in any suitable manner to a T-fitting 55 at the top of the cutter guard 46 and to secure feed pipes 56 so as to extend downwardly at opposed sides of the guard from the T-fitting 55 to nozzles 57 angled through the side walls of the guard so as to play the liquid against the work in the work clamp 27 at opposite sides of the cutting disc 16. In this way, without affecting the foregoing operation of the guard 46, the machine may be used as a wet machine without interfering in any manner with manual control of operations by the operator, nor with free access to the work clamp for inserting and removing the work and the efficient immovable gripping of the work during operation in the manner described herein.

Having thus fully disclosed the invention, and the manner and means deemed at this time to best carry the same into practical use and effect, what is claimed is:

1. In an abrasive cut off machine of the type including a work holder, a rotatable abrasive cutting disc above said holder and movable vertically to and from the same, and a swinging support for said cutter, a downwardly opening guard covering the cutter and depending therebelow to engage the work holder in advance of the cutter when the latter is lowered to cutting position, and a supporting connection for the guard on which it is movable relative to the cutting disc to thus provide for movement of the cutting disc below the guard, only when the latter is arrested in its downward movement.

2. In an abrasive cut off machine of the type including a work holder, a rotatable abrasive cutting disc above said holder and movable vertically to and from the same, and a swinging support for said cutter, a downwardly opening guard covering the cutter and depending therebelow to be arrested adjacent the work holder in advance, and during movement, of the cutting disc downwardly to the holder, the cutting disc being movable downwardly relative to the guard when the latter is arrested, and a pivotal connection between the guard and the swing frame on which the guard is yieldable, when arrested, relative to the cutting disc.

3. In an abrasive cut off machine of the type including a work holder, a frame mounted to swing above the holder, and a rotatable abrasive disc laterally offset from the frame and having a spindle journalled in the frame, a guard covering the disc and depending therebelow to be arrested adjacent the holder in advance of the disc when the swing frame is lowered, said guard having a side wall slot in which the cutter spindle has limited movement, and a pivotal supporting connection for the guard on which the latter is yieldable during movements of the cutter relative to the guard.

4. In an abrasive cut off machine of the type including a work holder, a frame mounted to swing above the holder, and a rotatable abrasive disc laterally offset from the frame and having a spindle journalled in the frame, a guard covering the disc and depending therebelow to be arrested adjacent the holder in advance of the disc when the swing frame is lowered, said guard having a side wall slot in which the cutter spindle has limited movement, and a pivotal supporting connection between the guard and the swing frame independent of the cutter.

5. In an abrasive cut off machine, a work holder, a table supporting the holder and having a dust discharge opening rearwardly of the holder, a frame mounted on the table to swing vertically above the holder, a spindle journalled in the forward portion of said frame, a cutting disc mounted on, and rotatable with, said spindle, a guard for said disc and movable therewith downwardly to the work holder, an upwardly opening dust chute upstanding from the table and bordering said opening, having side walls projecting forwardly to the work holder, and means pivotally connecting the guard to the swing frame and maintaining the lower rear portion of the guard within the said dust chute at all times.

6. In an abrasive cut off machine, including a supporting table, a work holder having an upper lengthwise V-groove and an intermediate upper transverse channel, chain engaging and holding means at the forward portion of the channel, the table having an opening at the rear of the work holder, a work gripping chain extending at its rear portion through said opening and for extension at its forward portion through said channel and connection with said chain engaging means, a pull bar pivoted to the table beneath said opening and to which the said rear end of the chain is connected, and a treadle mounted below the table and operatively connected to said pull bar.

7. In an abrasive cut off machine, including a work table, a movably supported and rotatable cutting disc, means for rigidly, immovably clamping work in single and multiple pieces within effective cutting range of the said cutting disc, comprising a work holder on the table, a flexible work-gripping member, means for adjustable anchoring engagement by the forward end portion of said member and located forwardly of said work holder, and means engaging the rear end of said work gripping member for placing the same under lengthwise gripping tension, including a treadle mounted below the table for operator foot control.

8. In an abrasive cut off machine, including a work table, a movably supported and rotatable cutting disc, means for rigidly, immovably clamping work in single and multiple pieces within effective range of movement of the cutting disc, comprising a work holder on the table, a flexible, inelastic work gripping member, means forwardly of the work holder for adjustable anchorage of the forward portion of the work gripping member, said table having an opening rearwardly of the work holder, through which the rear end portion of said member depends, a pull bar pivoted to the table and extending beneath its said opening, the depending rear end of the work gripping member being connected to said pull bar, and a treadle mounted below the table and connected to said pull bar for foot control of the lengthwise gripping tension of the work gripping member.

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