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SNUBBER FOR TAMPER BARS

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Fig. 1.

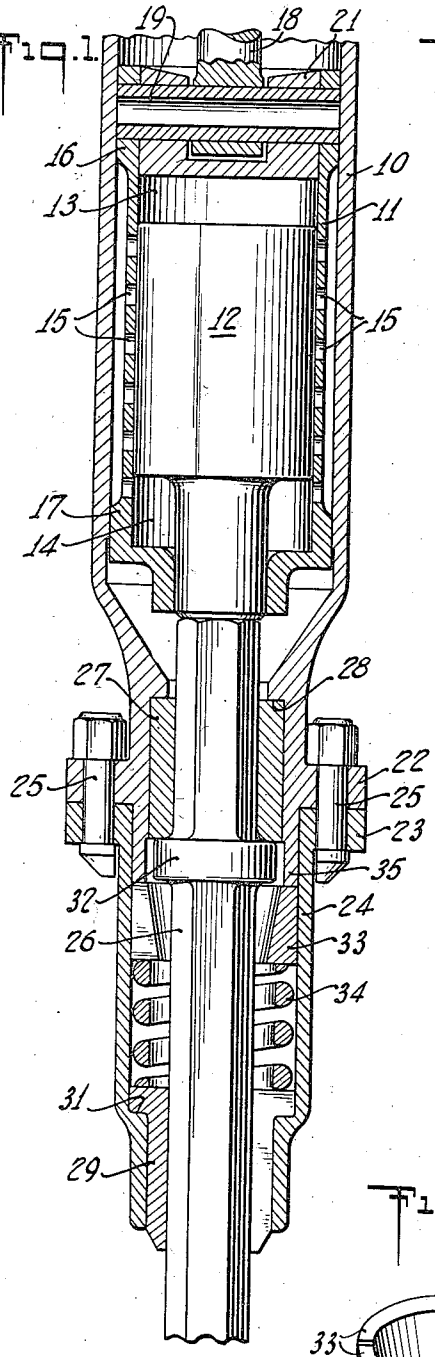



Fig. 2.

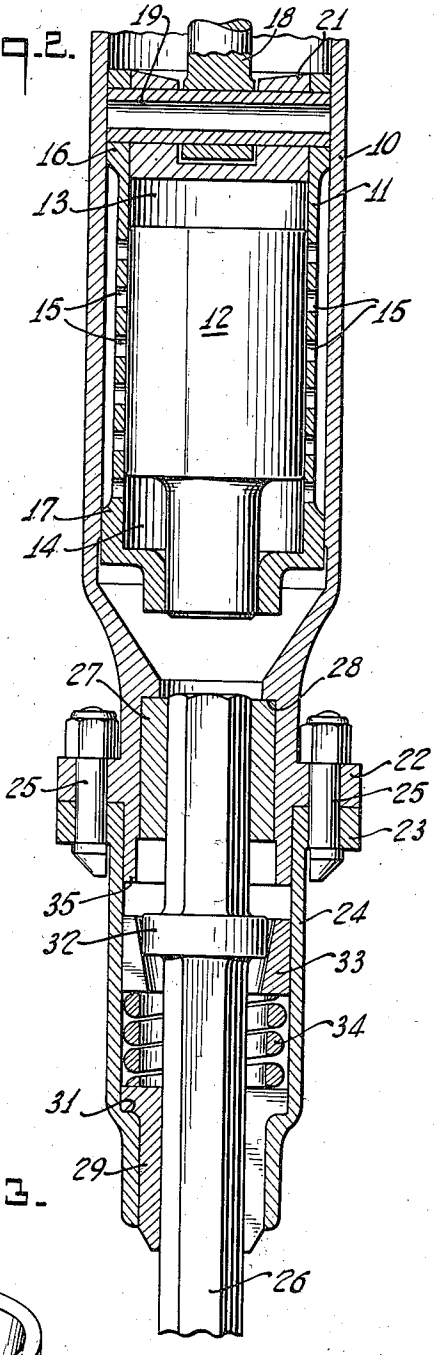
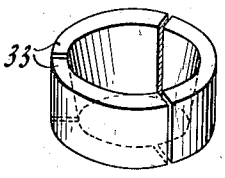



Fig. 3.




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## SNUBBER FOR TAMPER BARS

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11 Claims. (Cl. 125—33)

This invention relates to power driven percussive tools and particularly to means for absorbing the energy of the hammer pistons in such tools, when operated under idling or non-working conditions.

Tools of this class usually include a motor, a hammer piston driven by the motor, and a working implement freely reciprocable at the front end of the tool and arranged to receive impacts from the hammer piston when pressed against the work.

One object of the invention is to prevent damage to the tool incurred by its operation during periods when the working implement is not engaged with the work.

Another object is to maintain the working implement at all times in position to receive the percussive impulses of the hammer piston, including the idling periods during which the tool is moved from one working position to another.

A further object of the invention is to check the movement of the working implement through a portion of its travel by a braking action which will dissipate the energy imparted to the implement by the hammer piston.

A still further object is the provision of a snubbing device which is shaped to fit the conventional collar on a tamper bar, or similar implement, and which does not require the use of an implement having an abutment of special design.

In accomplishing these objects a novel front end construction for percussive tools has been devised, having, as its principal feature, snubber means yieldingly mounted within the front end and cooperable with an abutment collar on the working implement to control movement of the implement beyond its normal working range.

Other objects and structural details of the invention will be apparent from the following description when read in conjunction with the accompanying drawing, wherein:

Fig. 1 is a fragmentary view, in longitudinal section, of a percussive tool embodying the present invention, showing the parts in the course of the power stroke at the moment of impact between the hammer piston and the working implement;

Fig. 2 is a view similar to Fig. 1, showing the parts at the end of the power stroke of an idling cycle with the working implement checked in its extreme forward position; and

Fig. 3 is a detail view, in perspective, of the split ring forming part of the snubber means.

The invention has particular application to portable tamping and like tools and is disclosed as embodied in a known machine of this class, in commercial use as a tie tamper. The tool is suited for operation by an integrally formed gasoline engine but may be powered in any conventional manner without effect on the elements controlling movement of the working implement. The drawing illustrates only the lower section of the tool containing the hammer piston, the working implement operated thereby, and their associated mechanisms.

The principal support of these elements is a tubular casing 10 dependent from the main tool body and functioning as a hammer barrel. Within the casing or barrel 10 is a hammer assembly comprising a reciprocable cage 11 and a piston 12, the head of which has a sliding fit within the cage. The stem of piston 12 extends through the lower end of the cage 11 and constitutes the striking portion of the assembly. Above and below the piston head are compression chambers 13 and 14 connected alternately to the area surrounding the cage through openings 15 therein. The cage 11 is spaced from the internal wall of the barrel 10 by guide shoulders 16 and 17 which have longitudinal openings (not shown) to permit the free circulation of air around the cage. The opposite ends of the hammer cage being closed, reciprocation of the cage effects alternate compression and expansion of the air in chambers 13 and 14 and thereby enforces a similar movement of the free piston 12. As the cage descends, on the power strike, it moves relatively to the piston 12 until the pressure in chamber 13 rises to a height sufficient to halt the return movement of the piston and overcome its inertia. Under the force of such pressure the piston starts downward and rapidly accelerates to a high speed surpassing that of the cage. At or about the time the impact is delivered the cage begins its return stroke and, when such movement is partly completed, effects return of the piston through compression of the air in chamber 14.

The cage 11 is driven directly by the motor and reciprocates constantly during operation of the tool. A connection rod 18 extends from the motor into the barrel 10 where it is attached to the cage through a wrist pin 19 and a head block 21. The block 21 is pressed into the upper end of the cage and has a central opening receiving the lower end of rod 18. The pin 19 is passed through the cage, the block and the rod, and holds the parts in assembled position. The block 21 preferably is made of a metal more readily expansible than that of which the cage 11 is made in order that, under the heat of oper-

ation, it may expand into fluid tight contact with the internal wall of the cage. The head block thus acts as a seal closing the upper end of the cage, but is relieved of the weight of the hammer assembly.

At its forward or lower end the hammer barrel 10 is slightly reduced in diameter and is formed with laterally projecting ears 22 engaged by similar projections 23 on a tubular extension 24. The extension 24 is coaxial with the hammer barrel and is secured thereto by bolts 25 passed through the lateral projections 22 and 23. The shank of the working implement, in this instance a tamping bar 26, passes longitudinally through the extension 24 and into the open front end of barrel 10, the inner end of the bar being arranged to receive impacts from the stem portion of the hammer piston 12. In order properly to align the tamping bar with the hammer piston, a guide bushing 27, made to have a sliding fit with the shank of the bar, is pressed into barrel 10. Rearward movement of the bushing 27 is limited by engagement with an internal shoulder 28 in the barrel. In order further to guide and support the tamping bar 26 a bushing 29 is provided at the front of extension 24. This bushing is pressed into the nose of the extension from the rear and is held against outward movement by an internal shoulder 31 engaged by an enlarged head portion of the bushing. The bar 26 has an annular collar 32 which, when the parts are assembled, lies between the bushings 27 and 29. In the use of the tool, it is pressed forward or downward until the outer end of the bar is engaged with the work and such movement then continued, relatively to the implement, until the bushing 27 engages collar 32. By exerting a constant pressure on the tool this position of the parts is maintained as the bar advances through the work under the force of the hammer blows delivered by piston 12. At this time the full force of the blow of the hammer piston is taken by the working implement and transmitted thereby directly to the work. However, in an idling cycle of the tool, which may be defined as one in which the hammer assembly operates with the implement not pressed against the work, unless special provision is made for absorbing the force of the blow it is delivered to certain parts of the tool structure with destructive effect. Since the ordinary operation of the tool involves frequent lifting and re-positioning movements the idling periods occur often enough that the accompanying shocks become a factor adding to the cost of tool maintenance. Therefore, it is desirable to equip the tool with energy absorbing means which tends to prevent racing of the motor.

The present invention contemplates the provision of snubber means for this purpose cooperable with the tamping bar 26 to maintain it yieldingly in the path of movement of the hammer piston. The snubber means comprises a split ring 33 and a resilient mounting therefor in the form of a spring 34. The assembly comprising the ring 33 and its mounting are housed in the tubular extension 24 in position to encircle the shank of bar 26 in advance of collar 32 thereof. The spring 34 is based on the front bushing 29 and presses the ring 33 rearward into engagement with the end of an abutment sleeve 35, which sleeve preferably is formed as a projecting portion of the hammer barrel 10. The sleeve 35 extends forwardly beyond the rear bushing 27 and has a central opening of a size sufficient to receive and encircle the collar 32 of the working implement. Thus, in the operation of the tool, the collar 32 may enter the sleeve 35 and abut against the bushing 27 while the snubber ring 33 is held in an advanced position out of cooperative relation with the collar.

Referring also to Fig. 3, the ring 33 is made in three parts and therefore is capable of a radially spreading or outward movement. The outer periphery of the ring parallels the internal wall of the tubular extension 24 and lies adjacent thereto, the ring being held substantially coaxial with the tamping bar 26. The surface of the inner periphery of the ring 33 slopes downward and inward toward the longitudinal axis of the ring and is contacted by the collar 32 on bar 26 with a wedging action. At the upper end of the ring its internal diameter exceeds the width of abutment collar 32, but gradually decreases to points equal to and smaller than the collar. Thus, should the bar be permitted to move forward beyond its normal working stroke, the collar 32 enters the ring 33, and, engaging the inclined internal surface thereof, forces the ring first radially outward and then forward in the direction of movement of the bar. The radial movement of the ring presses its outer surface into intimate contact with the internal wall of the tubular extension and such frictional engagement impedes the subsequent forward movement of the ring. In this manner, and by the resistant action of spring 34, forward progress of the working implement is slowed and finally halted. The energy absorbed by the frictional contact between the ring 33 and the tubular extension 24 is given off as heat while the excess energy stored in spring 34 is expended in returning the ring into engagement with abutment sleeve 35.

During each idling cycle half the hammer blow is absorbed in friction and the remaining part taken by the spring 34. Following the movement of the parts during an idling cycle, Fig. 1 shows the hammer assembly on the power stroke at the moment of impact between the piston 12 and the tamping bar 26, while Fig. 2 shows the bar checked in its extreme forward position at the end of the power stroke. In moving from the Fig. 1 to the Fig. 2 position the bar, through the collar 32 thereon, contacts the ring 33 spreading it radially outward and carrying it axially forward within the tubular extension 24 against the forces of friction and spring compression. Under the combination of these forces the tamping bar loses its momentum without direct contact with the relatively unyielding housing elements. The ring 33 and the tamping bar are restored together from their extreme forward position as the hammer assembly moves through its return stroke, the tamping bar having now about half its original velocity. The travel of the ring is limited by engagement with the abutment sleeve 35 but the tamping bar is permitted additional movement which results in the collar 32 moving out of cooperative relation with the ring and into contact with the bushing 27. The bar rebounds from the bushing 27 with a further loss of velocity, and, as the collar 32 moves again toward the ring 33, the bar is struck by the hammer piston 12 which by this time is descending on the power stroke of a new cycle. The snubbing device thus functions solely as an energy absorbing unit for dissipating the output of the engine when the working implement is not engaged with the work. The device does not constitute a locking and holding means since the collar 32 moves freely out of engagement with the ring 33 during

each return stroke. In this connection it will be observed that the ring and the bar collar **32** make only a line contact, the collar having square slightly beveled edges while the angle of the internal taper on the ring is sufficiently large that it presents no complementary surface to the collar. It is unnecessary then manually to release the tamping bar from the ring to condition the tool for a period of working cycles since the tool always is so conditioned.

In the tool illustrated the snubber serves a particular function in that it protects the bushing **27** from damage and from dislodgement. If the tamping bar were allowed to drop out of reach of the hammer piston, the piston would be free to descend and strike this bushing, driving it from seated position against shoulder **28**.

For ease of assembly the forward bushing **29** may be made in two parts in order that it may be dropped in the rear of the tubular extension **24** after the working implement has been inserted through the front opening.

The invention is, of course, not limited in its application to a tie tamper but may be embodied iny any of the variety of percussive tools liable to damage when the impacts of the hammer piston cannot be transmitted to the work.

What is claimed is:

1. In a percussive tool, the combination of a hammer barrel, a tubular extension secured to the front of said barrel, a hammer piston reciprocable in said barrel, a working implement having a shank within said extension arranged to receive impacts from said hammer piston, the force of said impacts being transmitted thereby to the work, an abutment collar on the shank of said implement defining forward and rearward areas within said extension, a split ring within said extension in advance of said abutment collar and movable radially thereby into frictional engagement with the internal wall of said extension to check forward movement of said implement, and positioning means for said ring placing it beyond the path of movement of said abutment collar until said implement is driven forward during an idling cycle of the tool.

2. A percussive tool according to claim 1, characterized in that said positioning means comprises a limit sleeve on the front end of said barrel defining the innermost position of said ring and receiving said abutment collar, and a yielding means pressing said ring into engagement with said sleeve.

3. In a percussive tool, the combination of a hammer barrel, a tubular extension secured to the front of said barrel, a hammer piston reciprocable in said barrel, a working implement having a shank within said extension arranged to receive impacts from said hammer piston, the force of said impacts being transmitted thereby to the work, an abutment collar on the shank of said implement, a ring in said extension exceeding said abutment collar in diameter and having a cam surface on its inner periphery engageable by said abutment collar with a wedging action, said ring being split and movable radially under the force of engagement with said abutment collar into frictional engagement with the internal wall of said extension to check forward movement of said working implement, and a yielding means resisting forward movement of said ring.

4. In a percussive tool, the combination of a hammer barrel, a tubular extension secured to the front of said barrel, a hammer piston reciprocable in said barrel, a working implement having a shank within said extension arranged to receive impacts from said hammer piston, said impacts being thereby transmitted to the work, an abutment collar on the shank of said working implement defining forward and rearward areas within said extension, guide bushings for said implement in advance of said abutment collar and rearward thereof, said collar during operation of the tool being pressed against the rearward bushing by engagement of said implement with the work, and snubber means intermediate said bushings for absorbing the impacts of said hammer piston while the tool is withdrawn from the work, said snubber means comprising a split ring having a tapered inner periphery adapted to receive said abutment collar with a wedging action and movable thereby into frictional engagement with said extension to check forward movement of said implement, and yielding means interposed between said split ring and the forward bushing resisting axial movement of said ring in a forward direction.

5. In a percussive tool having working and idling cycles of operation, the combination of a hammer barrel, a tubular extension secured to the front of said barrel, a hammer piston reciprocable in said barrel, a working implement having a shank within said extension arranged to receive impacts from said hammer piston, the force of said impacts being transmitted thereby to the work during a working cycle and causing a forward movement of said implement independently of said extension during an idling cycle, an abutment collar on the shank of said implement, a split ring surrounding the shank of said working implement within said tubular extension and engageable by said collar when said implement is driven forward in an idling cycle, said ring being carried forward with said implement and movable radially outward thereby into frictional contact with the inner wall of said extension to check the forward movement of said implement, spring means for returning said ring and thereby said implement from forward position, and means interrupting the return movement of said ring but permitting a continued movement of said implement placing said collar out of cooperative relation with said ring.

6. In a percussive tool having working and idling cycles of operation, the combination of a hammer barrel, a tubular extension secured to the front of said barrel, a hammer piston reciprocable in said barrel, a working implement having a shank within said extension arranged to receive impacts from said hammer piston, the force of said impacts being transmitted thereby to the work during a working cycle and causing a forward movement of said implement independently of said extension during an idling cycle, an abutment collar on the shank of said implement, and a split ring surrounding the shank of said working implement within said tubular extension and engageable by said collar when said implement is driven forward in an idling cycle, said ring being carried forward with said implement and movable radially outward thereby into frictional contact with the inner wall of said extension to check the forward movement of said implement.

7. A percussive tool according to claim 6, characterized in that said ring has an internal diameter which is greater at one end of the ring than the diameter of said collar and which is less than the diameter of said collar at the other end of the ring, said ring being arranged with the

end of greater diameter facing said collar in such manner as to receive said collar therein upon a relative forward movement of said working implement, and an internal taper on said ring of an angle to limit engagement between said ring and said collar to a line contact.

8. In a percussive tool, the combination of a hammer barrel, a tubular extension secured to the front of said barrel, a hammer piston reciprocable in said barrel, a working implement having a shank within said extension arranged to receive impacts from said hammer piston, the force of said impacts being transmitted thereby to the work, an abutment collar on the shank of said implement, a split ring surrounding the shank of said implement within said tubular extension and engageable by said collar in response to a hammer blow delivered to said working implement moving it forward independently of said extension, said ring being carried forward with said implement and movable radially outward thereby into frictional contact with the inner wall of said extension to check the forward movement of said implement, and spring means supplementing said ring in absorbing the energy of the hammer blow.

9. In a percussive tool, the combination of a hammer barrel, a tubular extension secured to the front of said barrel, a hammer piston reciprocable in said barrel, a working implement having a shank within said extension arranged to receive impacts from said hammer piston, the force of said impacts being transmitted thereby to the work, an abutment collar on the shank of said implement, guide bushings for said implement in advance of said abutment collar and rearward thereof, said collar during operation of the tool being pressed against the rearward bushing by engagement of said implement with the work, and snubber means intermediate said bushings for absorbing the impacts of said hammer piston while the tool is withdrawn from the work, said snubber means comprising a ring composed of separate arcuate shaped parts and having a tapered inner periphery adapted to receive said abutment collar, said ring being carried forward with said implement and spread radially outward thereby into frictional engagement with the inner wall of said extension.

10. In a percussive tool, the combination of a hammer barrel, a tubular extension enclosing the forward end of said barrel and secured thereto, a hammer piston reciprocable in said barrel, a working implement having a shank projecting through said extension into said barrel and arranged to receive impacts from said hammer piston, an abutment collar on the shank of said implement, a guide bushing for said implement pressed in said barrel rearwardly of the forward end thereof, said collar being engaged with said bushing and encircled by the forward end of said barrel when the working implement is pressed against the work, and snubber means for said implement comprising a split ring within said extension held by engagement with the forward end of said barrel out of cooperative relation with said collar until said implement is driven forward by operation of the tool without said implement pressed against the work, said ring being then engaged by said collar and carried forward with the implement, and a cam surface on said ring cooperable with said collar to cause a spreading movement of said ring into frictional engagement with the inner wall of said tubular extension whereby the impact of the hammer blow is in part absorbed in friction.

11. In a percussive tool, the combination of a hammer barrel, a tubular extension secured to the front of said barrel, a hammer piston reciprocable in said barrel, a working implement having an outer work engaging end and a shank within said extension arranged to receive impacts from said hammer piston, an abutment collar on the shank of said implement, snubber means for said implement within said tubular extension between said abutment collar and the outer end of the implement and cooperable with said collar to check forward movement of said implement during an idling cycle of the tool, said means including a ring composed of separate arcuate parts, said ring having an internal diameter which is greater at one end of the ring than the diameter of said collar and which is less than the diameter of said collar at the other end of the ring, said ring being arranged with the end of greater diameter facing said collar in such manner as to receive said collar therein upon a forward movement of said working implement, and an internal taper on said ring engaged by said collar with a wedging action pressing said ring into frictional contact with the inner wall of said tubular extension.

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