The present invention relates to certain new and useful improvements, broadly speaking, in cow dehorners, and has reference in particular to the style or form of dehorner which is characterized by a portable frame, usually a rectangular type of a frame, a pair of cooperating cutter blades operatively mounted in said frame for shearing the intended horn in a generally well known manner, it being the principal objective here to provide cartridge-powered means which develops desired pressurized force to operate a reciprocable piston in a complemental fixed cylinder on the frame, all in a manner to actuate the movable blade, to forcibly impel it toward the complemental blade and to thus shear the stated horn quickly and with requisite nicety.

It is desired to state at the outset of the description that the subject matter of the instant disclosure has to do with analogous subject matter covered in the Cartridge-Powered Cow Dehorner, Serial No. 428,186, filed by me on May 7, 1954. Briefly, the copending application has to do with a rectangular or equivalent frame, a pair of cooperating cutter blades, one of which is preferably fixed and the other relatively slidable and movable toward and from the fixed blade. The cartridge-powered means takes the form of what is broadly referred to as a pistol-like gun in which blank cartridges are fired to engender the necessary explosive forces and to impel or impact the same against a piston, the piston being reciprocable in a cylinder fixedly joined with the frame. The piston rod is connected with the movable blade, and hence, by firing the gun, this in a generally well known manner, sufficient forces are generated to "shock" and thus drive the sliding cutter blade toward the cooperating blade and to, in this manner, bring about the desired horn shearing result.

Since filing the above stated application, Serial No. 428,186, other variations and modifications of the over-all broad concept have been devised for likely adoption and use, and these are herein revealed singly and collectively with the thought in mind of providing members of the public, manufacturers and retailers with diversified adaptations which stem from the generic aspects of the over-all invention as will be clear upon considering the subjects matter of Serial No. 428,186 and that which constitutes the instant disclosure.

In carrying out the principles of the instant invention, one phase of the same has to do with the aforementioned cylinder attached to one end of the frame, an explosive gun attached to the other end of the cylinder, a piston reciprocable in the cylinder and connecting with the cooperating blade, a vent in the intermediate portion of the cylinder, and a by-pass carried by a diametrically opposite side of the cylinder.

The objective in reference to the structural adaptation just comprehended is to utilize the stated vent to facilitate the return of the blade and piston to their respective starting positions and to employ the by-pass, preferably exteriorly of the cylinder, so that ample compressed gases are trapped in the remote end of the cylinder, thereby providing a cushioning effect to the end opposite to the gun end, to utilize the same as a desirable way and means of cushioning and, in fact, limiting the travel of the piston so that the intended travel action of the cutter blade will be limited to prevent over-driving and damaging of the same.

Novelty in addition to the above is predicated on a further embodiment which has to do with, briefly summarized, the stated rectangular frame, the fixed and movable cutter blades, a cylinder affixed to and projecting laterally from one end member of the frame, the gun on an end of the cylinder away from the frame, a piston operable in the cylinder and having a rod connected with the movable cutter blade, and buffer and cushioning cylinders, auxiliary to the first named cylinder, and which are interposed between the sliding blade and the adjacent and member of the frame, the blade having correspondingly fitted pistons operable in these auxilliary cylinders so that the air which is trapped in these cylinders serves to enable the same to provide cushioning or check devices which, obviously, limit the travel action of the movable blade.

Then, too, another phase of the invention has to do with a distinctive mode and means for imparting sliding motion to the movable or slidable cutter blade, this by way of the formation of a cam surface or edge on one end of the blade and a cooperating piston-driven wedge or block which latter is provided with idling rollers, certain of which engage the cam edge in a manner to transmit motion from the force-driven piston to the edge member, and consequently, to the movable cutter blade.

Objects, features and advantages in addition to those specifically enumerated will become more readily apparent from the following description and the accompanying sheets of illustrative drawings.

In the drawings:

Figure 1 is a top plan view, with portions broken away and shown in section, of one embodiment of the over-all invention herein shown, described and claimed;

Figure 2 is a section on the irregular longitudinal line 2—2 of Figure 1, looking in the direction of the arrows;

Figure 3 is a cross-section on the line 3—3 of Figure 1, looking and in the direction of the arrows;

Figure 4 is a plan view, similar to Figure 1, showing another modification similar to that depicted in Figure 1 and with portions broken away and shown in section;

Figure 5 is a lengthwise section in section and elevation, taken on the irregular line 5—5 of Figure 4, looking in the direction of the arrows;

Figures 6 and 7 are transverse or cross-sectional views taken on the planes of the line 6—6 and 7—7, respectively, of Figure 1, looking in the direction of the respective arrows;

Figure 8 is a plan view showing another modification, and in section and elevation;

Figure 9 is a cross-section on the irregular line 9—9 of Figure 8, looking in the direction of the arrows;

Figure 10 is an enlarged or exaggerated detail section on the line 10—10 of Figure 8, looking in the direction of the arrows; and

Figure 11 is a section on an enlarged scale taken on the line 11—11 of Figure 4, looking in the direction of the arrows.

Reference is had first to the form of the invention which will be herein identified as Figures 1 to 3, inclusive. With reference to these figures, and utilizing corresponding reference numerals and properly placed lead lines, the aforementioned rectangular frame is denoted generally by the numeral 12, and it may be of any configuration. It includes spaced parallel, longitudinal side members 13 and 14 whose inner longitudinal sides or surfaces are provided with appropriate guide grooves
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15—15 for the edge portions of the relatively slidable cutter blade 16. This slides back and forth between the respective side members and toward and from the transverse end members 17 and 18, and has an appropriate beveled or equivalent cutting edge 19. The relation is so stated that the portion of the relative slidable cutter blade 16 is denoted at 20 and has an accurate toothed or serrated edge 21. Appropriate fastenings 22 are employed to secure this blade between the mating members of the frame. Secured intermediate its ends to the transverse end member is a cylinder-barrel 23, one end portion of which is screw threaded at 24 and spaced away from the end member 17. The other end portion 25 projects into the space of the frame, as best shown perhaps in Figure 1. This cylinder is provided intermediate its ends and on one side with an orifice or a vent 26. On the other side, it is provided with a externally arranged by-pass pipe or tube 27 having its ends 28 and 29 located one to the right of the port 26 and the other to the left thereof. The piston rod 30 is reciprocable in this cylinder and has an appropriately constructed piston 31 which is preferably a so-called O-ring and which is provided with appropriate packing rings 32. There is a similar O-ring 33 at the other end, as shown in Figure 2, which is provided with similar packing rings 34 and which is located in the inner end portion of the cylinder and serves as a bearing or suitably packed guide bushing for that end portion of the piston rod 35 which projects there through and is operable therebetween. This end portion is screw threaded as at 36 and is threadedly connected with a yoke 37 which is, in turn, fastened at 30 on the cooperating end of the blade, a locking nut being provided at 39.

The cartridge containing and firing means, here broadly referred to as a pistol-like gun, is denoted generally by the numeral 40. It has a suitable stock 41 with a pistol grip 42, a guard 43, a trigger 44, a barrel 45 in which the cartridge 46 is placed for firing, the barrel having an integrally screwed thread end portion 47 which is coupled to the screw threaded end of the cylinder barrel 23, all as best shown in Figure 2. This lines up the “gun” with the piston equipped cylinder for appropriate operative association. The cartridges are carried in a readily applicable and removable so-called clip 48 which is appropriately mounted. The conventional type sliding bolt is denoted at 49. As before stated, any appropriate cartridge firing gun for generating the desired explosive forces and power may be utilized, and hence, removably mounted on the threaded end of the cylinder 23. When the gun is fired, it serves to drive the piston 51 from right to left in the drawings, which imparts the desired sliding and driving motion to the movable cutter blade 16. The exhaust vent 26 permits the return of the piston to its starting or ready-to-shoot position. The principle of action here is as follows: When the cartridge is fired, the piston travels to by-pass 28. The gases created by cartridge rush through opening 28 and out 29 and thus build up the needed pressure to create a stop in addition to normal pressure created. The piston carries the knife through the entire cutting stroke before exhaust escapes first through 28 and the remainder to atmosphere through port 26. The complete shearing step is completed before compression becomes effective.

In the form of the invention depicted in Figures 4, 5, 6 and 7, an embodiment distinguishing only slightly from that identified as Figures 1 to 3, inclusive, is characterized by a rectangular frame 50 with the movable blade 51 having a V-shaped cutting edge 52 and with its edge portions slidable in guide grooves 53—53 in the longitudinal side members 54—54. The fixed blade 55 has a similar cutting edge 56, and this blade is fixedly mounted between the side members and the transverse end member 57. The opposite transverse end member 58 carries a cylinder-barrel 59, the left hand end 60 of which projects into the space of the frame. Here, the piston 61 com-

prises a rod 62 connected to a piston head 63 with packing rings 64, all as already described. There is a similar bushing and guide at 65 with packing rings 66. The piston rod is connected with a fork or yoke 67 by a way of a threaded end 68 and a lock nut 69. On the threaded end 70 of the cylinder is the screw threaded connector 71 of the aforementioned cartridge containing and firing gun or piston 40. The details here are the same as already described, and the same numbers already used are applied for convenience. Thus, the gun is fired and the piston in the cylinder 15 is moved in the same way to drive or operate the sliding cutter blade 51. The difference here is that the aforementioned by-pass 27 is omitted. However, the vent 62A is retained. The check or cushioning devices are different here, in that I utilize a pair of auxiliary spaced parallel cylinders 72 and 73. These have threaded ends 74—74 screwed into sockets provided therefor in the frame end member 58. There is a screw cap 75 on the opposite end of each cylinder. The numerals 76 designate vents. The pistons are small pistons and the head of each is denoted at 77, and the rod at 78, and the rod extends through the screw cap 74 where it is threaded into a socket 79 provided in a support in the core portion of the sliding cut end of the cutter blade 51.

In the form of the invention just described, the operation is the same as that already described in reference to Figures 1 to 3, except that the cushioning means, as is evident, is different and operates in a slightly different manner. That is to say, as the piston is forcibly driven in the cylinder 59 when the cartridge in the gun is fired, the cutter blade 51 slides from right to left in the drawings. In so doing, the auxiliary or smaller pistons operate in their auxiliary cushioning cylinders 72 and 73. That is to say, these pistons travel likewise right to left and the air which is trapped therein to the left of each piston is compressed in the left hand end of the cylinder and sufficient of a “cushion” is built up to check the stroke of the main piston 61 and consequently the travel action of the cutter blade 51.

Taking up now the final or third embodiment or form of the invention, this is, as before stated, covered in Figures 8, 9 and 10. With reference to these figures, the frame is denoted by the numeral 80 and comprises suitably constructed longitudinal members 81 and 82 with a transverse end member at the right, as at 83, and at which end of the structure, the fixed blade 84 is secured. This has a toothed cutting edge 85. The movable blade is operable in guides 86, said blade being secured generally by the numeral 87 and an appropriate cutting edge 88 movable toward and from the cutting edge 85. This blade also has oppositely disposed outstanding lugs 89—89 operable in slots provided therefor in the side members of the frame which have piston rods 90—90 affixed thereto at corresponding end. The piston rods carry piston heads 91—91 operable in the cushioning cylinders 92—92 formed integrally with the exterior surfaces of the side members of the frame. Here again, these cushioning cylinders have vents 93—93. Appropriate bushings are threaded, at 94, in the opposite ends of the cylinders. Thus, the stop action here is the same in that the trapped air which is compressed and trapped in the respective cylinders acts on the pistons to limit the travel of the movable blade 87 in a direction from left to right. The principal novelty in this form of the invention has to do with the cartridge-powered means and especially the means for transmitting them from to the blade. To this end, it will be seen that the left hand end of the cutter blade has a beveled surface, as at 95, to accommodate idling rollers 96 on the correspondingly beveled side or surface 97 of the wedge-shaped block or cam 98. On an opposite lengthwise edge, this block is also provided with idling antifriction rollers 99 which operate in a guideway or groove 100 provided therefor in the transverse end member 101 of the
frame. The frame is fashioned into a sort of a special cam or wedge accommodating chamber, as at 102. This has a screw threaded hole or socket 103 in one end portion 104 by which the operation is denoted at 110, and this is operable in the end of the cylinder in the manner shown and the cylinder is screw threaded at 111 to accommodate the coating connector portion 112 of the "gun" 113.

It will be obvious from the form of the invention just described that when the gun is fired, the piston is operable in its cylinder 105 in the usual way, and the piston, in turn, serves to drive or impel the wedge-shaped cam block 98 in an obvious manner. In so doing, the idling rollers 96 on the cam edge 98 engage the cam edge 95 of the sliding blade 87, and hence, the blade is slid in a direction from left to right in Figure 8, in an obvious manner. Here, the buffer and cushioning cylinders 92—93 and their cooperating pistons come into effect to satisfactorily "check" the stroke of the cutting blade, this in a substantially obvious manner.

It is believed that the detailed description, when studied in conjunction with the various views of the drawings, with reference to the several embodiments of the invention, their similarities and dissimilarities, the operation of each, and the features and advantages. In these circumstances, a more explicit explanation is thought to be unnecessary.

What is claimed as new is as follows:

1. A power operated cow dehorner comprising a portable frame, a pair of cooperating cutting blades supported for operation in said frame, adjacent ends of said blades having overlapping cutting edges which, as they overlap, bring about the intended and desired horn shearing result, at least one of said blades being fixed and slidable at high speed toward the other blade, gas powered force producing means mounted on said frame and embodying a stationary cylinder, a piston reciprocable in said cylinder, a cartridge containing and firing gun mounted on said cylinder, said piston embodying a rod connected with said slidable blade, and means limiting in construction and functioning form which serves to limit the travel of the piston in one direction and consequently the corresponding travel distance of the sliding cutter blade and which also serves to check and bring said blade to a stop and to thus prevent damage to the cutting edge of said blade, said piston embodying a readily applicable and removable head mounted on a rod, said head provided with packing rings, and a guide for said rod fixedly mounted in one end of said cylinder.

2. The structure defined in claim 1 and wherein said cylinder is integral intermediate its ends with an end member of the frame and with one end portion of the cylinder projecting into the space of the frame, that is, into a position midway between the side members of the frame.

3. The structure defined in claim 1 and wherein said cylinder is integral intermediate its ends with an end member of the frame and with one end portion of the cylinder projecting into the space of the frame, that is, into a position midway between the side members of the frame, said cylinder being provided intermediate its end of said cylinder.

4. The structure defined in claim 1 and wherein said cylinder is integral intermediate its ends with an end member of the frame and with one end portion of the cylinder projecting into the space of the frame, that is, into a position midway between the side members of the frame, said cylinder being provided intermediate its end of said cylinder.

5. The structure defined in claim 1 and wherein said

6. The structure defined in claim 1 and wherein said frame embodies side members connected together by end members, said side members being slotted, auxiliary cylinders fixedly mounted on said side members, pistons slidably in their respective auxiliary cylinders, said cutting blade being provided with outstanding legs engaging through and beyond the respective slots in the side members and slidable back and forth in said slots, said pistons having rods connected with their respective lugs.

7. A power operated cow dehorner comprising a portable frame, a pair of cooperating cutting blades supported for operation within the marginal limits of said frame, adjacent ends of said blades having overlapping cutting edges which, as they overlap, bring about the intended and desired horn shearing result, at least one of said blades being fixed, the other blade being propelled and sliding at high speed toward and from the fixed blade, gas powered force producing means mounted on said frame and embodying a stationary cylinder, and piston means embodying at least one piston reciprocable in said cylinder and including a complemental piston rod which is connected with said piston and also connected with said cylinder containing and firing gun mounted on one end of said cylinder, the other end of said cylinder being closed and providing a chamber between itself and the adjacent relatively reciprocable piston and in which chamber cushioning media is compressed in a manner which serves to limit the travel of the piston in one direction and subsequently the corresponding travel distance of the sliding cutter blade and which serves to gradually check and bring said blade to a stop and thus prevent damage to the cutting edge of the blade.

8. A power-operated cow dehorner comprising a portable frame, at least one horn cutting blade mounted for operation on said frame, said blade being movable relative to the frame, said blade being adapted to be powered and forcibly driven at rapid speed, a cylinder rigidly mounted on said frame, said cylinder being closed at one end, a piston mounted for reciprocation in said cylinder and having a complemental piston rod operatively connected with said cutting blade, blank cartridge containing and firing means communicatively connected on and at the other end of said cylinder and functioning, when the cartridge is fired, to generate explosive gas pressure which is focused and acts upon said piston and serves to bring about the instantaneous high speed actuation of the piston, rod and cutting blade, said cylinder being provided intermediate its ends and on one side with a used gas exhaust port, being provided on an opposite side with a pressurized gas intake port and at a longitudinally spaced point with a complemental discharge port, said ports being progressively valved and closed by the cooperation of the confined piston therewith, and a by-pass for the pressurized gas communicatively connecting said intake and discharge ports and serving to permit gas under pressure to be trapped and compressed in the cylinder between said closed end and the piston advancing toward that end, whereby to utilize the thus trapped gas as a cushioning and check media and limiting the travel of the piston in said cylinder in one direction.

9. A power operated cow dehorner comprising a portable frame, a pair of cooperating cutting blades supported for operation in said frame, adjacent ends of said blades having overlapping cutting edges which, as they overlap, bring about intended and desired horn shearing result, at least one of said blades being designed to be propelled at high-powered gunshot speed toward the other blade, a cylinder fixedly mounted on said frame, said cylinder being closed at one end, a piston mounted for recipro-
tion in said cylinder, a rod connected at one end with said piston and reciprocable through and beyond the closed end of the piston and connected at its other end with said movable blade, said cylinder having a vent and being further provided on one side intermediate its ends with longitudinally spaced pressurized gas intake and discharge ports, said ports being communicatively connected by way of the cooperating end portions of a pressurized gas by-pass, and a cartridge containing and firing gun operatively and communicatively mounted on the other end of said cylinder in a manner to generate gas which is expelled from the gun into the cylinder to drive the piston and operate the movable cutter blade and which is also shunted from the cylinder through the intake and discharge ports in a manner to automatically trap gas between the closed end of the cylinder and the advancing end of the piston.

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