

Sept. 29, 1942.

M. F. WEAVER

2,297,090

DELAYED ACTION CAM MECHANISM

Filed Jan. 14, 1942

2 Sheets-Sheet 1

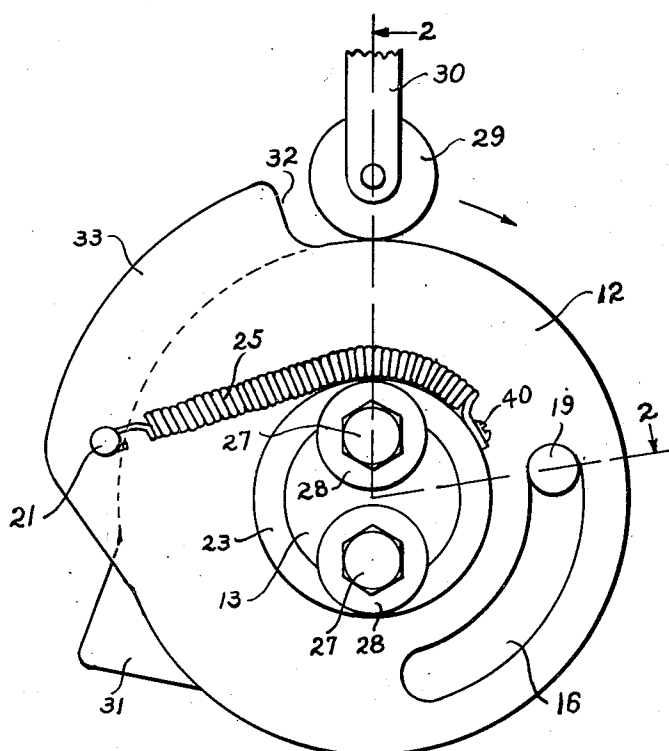


FIG. 1.

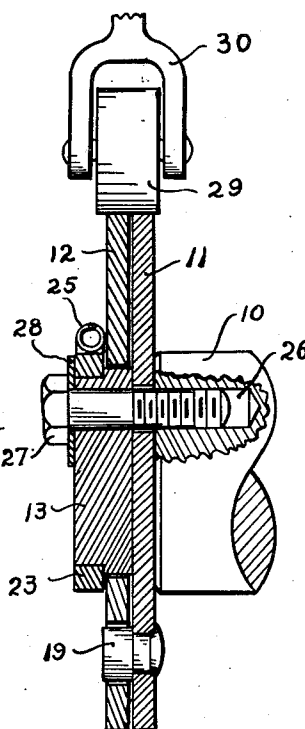


FIG. 2.

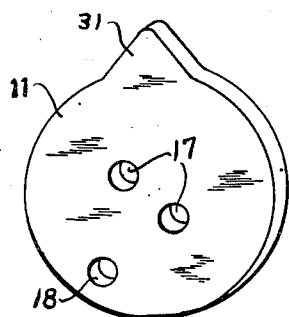


FIG. 3.

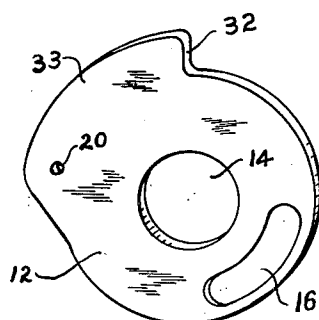


FIG. 4.

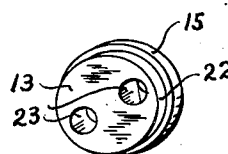


FIG. 5.



FIG. 6.

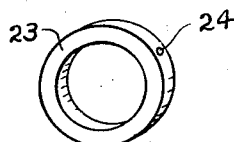


FIG. 7.

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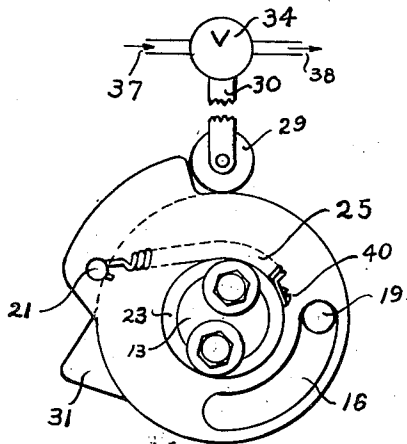


FIG. 8.

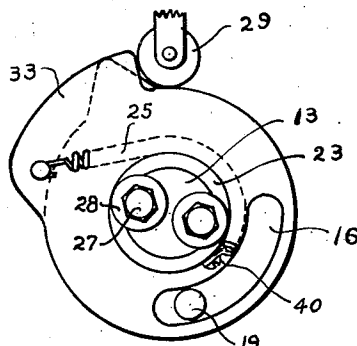


FIG. 9.

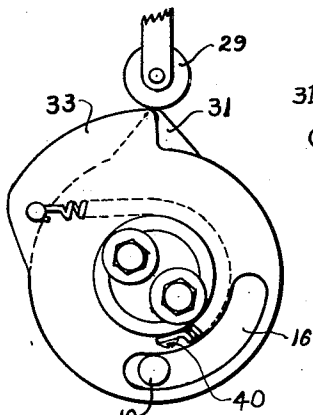


FIG. 10.

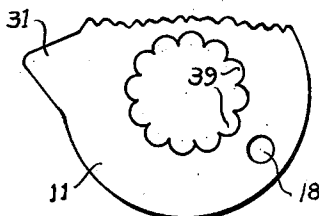


FIG. 11.

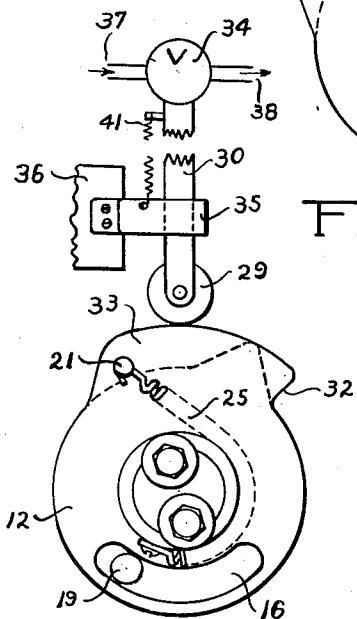


FIG. 12.

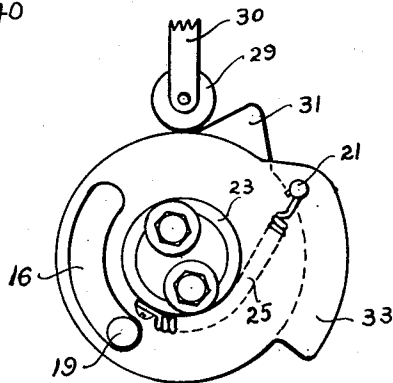


FIG. 13.

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2,297,090

DELAYED ACTION CAM MECHANISM

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Application January 14, 1942, Serial No. 426,697

8 Claims. (Cl. 74-567)

This invention relates to cam mechanisms, more particularly it relates to a delayed action cam mechanism for controlling air valves used in connection with intermittent operating machines such as punch presses and has for its principal object the provision of a cam mechanism actuated by an intermittent operating shaft for operating an air valve to provide air for ejecting or blowing stamped pieces out of the die or blowing it as it drops from the die so that it will not fall on the lower die or on the new blank and ruin the parts or even the dies when the next punching or pressing operation takes place. This also eliminates the need of the operator to remove the part from the upper die if it sticks there or to remove it if it falls on the lower die. It can also be used to blow chips and the like from pieces formed in a punch press or similar pressing machine.

Punch presses are usually provided with a cam for operating an air valve. The air valve allows air, from a compressed source of supply, to pass through a passageway and then is directed at the formed piece or at the dies to remove the stamped piece, chips, dirt, or any other foreign material. These cams are located on an intermittently operating shaft. Since all parts of a punch press or other stamping or pressing machine operate intermittently, the cam can only be placed on a shaft that is in motion during the punching or pressing operation. The best time to eject the pressed part is while the press is coming to rest and for a short period thereafter. During this time the punched or pressed piece tends to fall from the die or can be blown from the die and blown to a point where it does not interfere with the following cycle of operation. At this time it also permits the air to blow the chips and dirt from either or both the part and the dies. The present type of cam arrangement does not provide any blowing action after the machine comes to rest after the punching or pressing operation because the cam must provide for the closing of the air valve while it is still in motion. Therefore, the present type of cam does not provide an air stream for ejecting the part cleaning the dies at the most essential time.

My invention provides a novel cam mechanism adapted to keep the air valve open a predetermined length of time after the operating shaft comes to rest or stops. The air valve is then closed to prevent the use of excessive quantities of compressed air. My novel invention provides a primary or positive action cam plate fastened to a shaft for opening the air valve and

a secondary or delayed action cam plate operated by means of spring action after the valve is opened and the shaft and main cam stop or come to rest, thus keeping the valve open a predetermined length of time after the machine stops.

My invention has for its principal object the provision of a delayed cam action for operating an air valve to provide an air blast for ejecting or removing the pressed part from the die in order to increase the capacity of the machine and at the same time eliminate the possibility of the dies being ruined.

Another object of my invention is to provide an air blast at a time advantageous to remove chips and dirt from the die.

My invention will be best understood from the detailed description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which:

Fig. 1 is a front elevation showing my novel valve mechanism.

Fig. 2 is a sectional view taken along line 2-2 of Fig. 1 looking in the direction indicated by the arrows.

Fig. 3 is a pictorial view of the main or positive action cam plate.

Fig. 4 is a pictorial view of the delayed action cam plate.

Fig. 5 is a pictorial view of the hub upon which the delayed action cam plate operates.

Fig. 6 is a pictorial view of the stop pin used to limit the independent motion of the delayed action cam plate.

Fig. 7 is a pictorial view of the spring tension adjusting ring.

Fig. 8 is a front elevation of my cam arrangement together with a diagrammatic representation of the air valve that it operates.

Fig. 9 is a front elevation showing my novel delayed cam action mechanism in one of its operative positions.

Fig. 10 is a front elevation of my delayed cam action mechanism showing the cam follower in a position where the air valve is open.

Fig. 11 is a front elevation showing the delayed action cam holding the valve open after the action of the machine has ceased.

Fig. 12 is a front elevation showing the position my delayed cam action mechanism come to rest after its cycle of operation.

Fig. 13 shows a fragmentary view of a modified form of the positive action cam plate.

Referring to the drawings 10 is punch press or other pressing machine shaft that operates intermittently. My novel delayed valve action mechanism is fastened to the end of the shaft 10. The mechanism comprises a positive action cam 11 shown in Fig. 3. The positive action cam 11 is provided with holes 17 used to secure the cam rigidly to the shaft 10 when assembled. The positive action cam is further provided with an aperture 18 adapted to hold the stop pin 19. The delayed action cam 12 shown in Fig. 4 is provided with an aperture 14 for operating on the outer surface 15 of the hub 13. The delayed action cam is further provided with an elongated curved slot 16 and a hole 20 to hold the spring anchor pin 21. Fig. 5 shows the hub 13 with the larger bearing surface 15 and the smaller surface 22. The hub 13 also has two annular holes 23 used to secure the hub in position. Fig. 6 shows the stop pin 19 which is fastened in the hole 18 of the positive action cam 11. Fig. 7 discloses the spring tension adjusting ring 23 which is provided with a tapped hole 24 adapted to receive a screw for securing the end of the spring 25.

The unit is assembled as shown in Fig. 2. The positive cam plate 11 is placed against the end of the shaft 10. The hub 13 is placed against the cam plate 11 so that the holes 23 and the holes 17 are in alignment. The delayed action cam is placed against the cam plate 11 so that the bearing surface 15 of the hub 13 operates in the aperture 14. The stop pin 19, fastened in the aperture 18 of the positive action cam 11, operates in the elongated slot 16. The spring tension adjusting ring 23 is then placed on the smaller bearing surface 22 of the hub 13. Cap screws 27 provided with washers 28 are inserted through the holes 23 of the hub and 17 of the positive action cam and are then screwed into tapped holes 26 in the end of the shaft 10 holding the entire unit assembled and securing the unit to the shaft.

The position of the cam 11 is fixed when the unit is assembled. The hub 13 is also rigidly secured and is pressed against the positive action cam plate 11. The cam plate 12 is slightly thinner than the width of the bearing surface 15 of the hub 13, thus providing sufficient clearance to permit free rotary movement of the cam plate 12 on the hub 13. The spring tension adjusting ring 23 holds the delayed action cam plate 12 on the hub 13. The spring tension adjusting ring 23 is fastened in a predetermined position on the hub 13 when the cap screws 27 are tightened. One end of the tension spring 25 is secured to the spring anchor pin 21, while the other end of the spring is secured to the spring tension adjusting ring 23 by means of a screw 40 which is fastened in the tapped hole 24.

The roller cam follower 29 is held against the outer surface of the cam plates 11 and 12 by means of spring pressure or other suitable pressure. The cam follower and the link 30 are limited to radial motion only. When the cam follower 29 is in its lower position the air valve operated by the link 30 is closed. As soon as the cam raises the follower 29, the air valve opens and it remains open until the cam allows the roller 29 to return to the lower position. In order to keep the valve open after the motion of the shaft 10 stops the cam must provide motion after the shaft stops. This is accomplished by the use of the delayed action cam 12 and the spring 25.

The delayed action cam plate 12 is not rigidly secured to the rest of the unit, instead it is permitted to oscillate on the hub 13. The extent of oscillation is limited by the length of the slot 16. The tension of the spring 25 tends to hold the delayed action cam plate 12 in a position relative to the positive action cam plate 11 as shown in Fig. 1.

The positive action cam shown in Fig. 3 is provided with a rapid rising lobe 31, which immediately falls rapidly. The remainder of the cam plate 11 is circular. The delayed action cam plate 12 shown in Fig. 4 is provided with a circular portion of the same radius as the circular portion of the cam plate 11, for about three-fourths of its circumference. The remainder of the circumference is provided with a substantially instantaneous rise shown at 32. The radius remains constant after this point of instantaneous rise for a substantial period as shown at 33 and then drops back to the original radius.

In operation the shaft 10 operates intermittently, one revolution being one cycle of operation. As the shaft 10 begins a new revolution the entire valve assembly rotates with the shaft 10 as a unit in direction indicated by the arrow in Fig. 1. During this time the cam follower 29 rolls on both cam faces as shown in Fig. 2. The valve 34 being in a closed position while the cam follower 29 is on the lower cam surfaces, such as shown in 1, 2 and 8. As the entire unit continues to rotate, the radial face 32 of the delayed action cam 12 contacts the roller follower 29 as shown in Fig. 8. The delayed action cam 12 stops in this position while the remainder of the unit continues to turn. One end of the spring 25 is fastened to the stop pin 21 and the other end is fastened to the spring tension adjusting ring by means of the screw 40. When the delayed action cam plate 12 stops and the remainder of the unit continues to rotate, the spring 25 is expanded thus storing up energy in the spring 25. Fig. 9 shows my delayed cam action mechanism in a position where the spring 25 has been partially expanded. The delayed action cam 12 is still prevented from turning by the cam follower 29 while the lobe 31 of the positive action cam plate 11 has contacted the roller follower 29. As the positive action cam plate 11 continues to rotate, the follower 29 is moved up or outward radially from the center of the cam and shaft. This radial movement of the cam roller follower 29 opens the valve 34 by means of a link member 30. As the unit continues to turn the cam lobe 31 lifts the cam follower 29 to its maximum height as shown in Fig. 10. In this position the spring 25 has been fully expanded and the delayed action cam has been released because the cam roller follower 29 has been lifted, by the lobe 31 of the positive action cam plate 11, unto the top surface of the cam lobe 33. From the position shown in Fig. 10 the entire unit continues to rotate until the shaft 10 stops at the end of its cycle. The plate 11 being rigidly secured to the shaft 10 also stops when the shaft stops the lobe 31, then being in the position shown in Fig. 11. The cam follower 29 rides on the upper surface of the cam lobe 33 after remainder of the unit stops. The tension in the spring 25 causes the delayed action cam plate 12 to turn after the remainder of the unit and the shaft 10 stop. Thus, the valve 34 is held open after all other motion of the cycle of operation ceases. Fig. 11 shows the positive action cam 11 in its stopping position while the delayed action cam

continues to turn on the hub 13 due to the tension of the spring 25. The valve 34 is held open until the roller follower 29 drops from the cam lobe 33 back to the lower circular portion of the delayed action cam plate. The delayed action cam plate comes to rest when the stop pin 19 engages with the end of the elongated slot 16 as shown in Fig. 12. Fig. 12 shows the delayed action cam unit as it comes to rest after one complete cycle. When the punch press or stamping machine is put into the next cycle of operation, the shaft 10 turns and my delayed cam action mechanism goes through another cycle of operation as explained above thus opening and closing the valve 34 at the desirable time.

Fig. 12 shows the arm member 30 passing through the bracket 35 which limits the motion of the link member 30 to an up and down or radial motion. The bracket 35 is fastened to the punch press or machine indicated at 36. An inlet line 37 carries compressed air from a source of supply to the valve 34 while the line 38 carries the compressed air from the valve 34 to the point where it is used to eject the stamped part or to blow chips and dirt from the dies or the stamped piece.

From the above description it will be noted that my novel device keeps the air valve 34 open for an appreciable length of time after the punch press or pressing machine stops. As stated previously, the desirable time for providing the air blast for cleaning is immediately after the press stops. As the press stops the stamped piece tends to fall from the die and this is the proper time for the air blast to occur. In the present valve arrangement for presses, a cam is fastened on the press shaft. This cam must necessarily open and close the valve while the machine is still in motion. Thus the air blast is provided before the machine stops at the end of its cycle which is too early. My improved cam mechanism provides motion or cam action after the press stops. My device does not close the air valve until after the press or machine stops which provides an air blast at the desirable time. The period of valve opening can be varied by changing the length of the cam lobe 33. The period can also be governed by changing the tension in the spring 25. This is accomplished by turning the spring tension adjusting ring 23. After the desired tension is obtained in the spring 25, the spring tension adjusting ring is held in position by the cap screws 27.

The positive action cam plate 11 can be provided with a notched opening at its center as shown in Fig. 13 in place of the holes 17. The notches 39 engage with the cap screw 27 locking the cam in position. The notches 39 provide a means for changing the position of the positive action cam plate 11 with respect to the shaft 10. The change of position provides a means for varying the time at which the valve opens.

My novel delayed action cam mechanism provides a very flexible arrangement for opening and closing the air valve 34. The opening of the valve can be made to occur sooner or later in the cycle by changing the position of the fixed cam 11 with respect to the shaft 10. The closing of the valve can be made to occur earlier or later in the cycle by decreasing or increasing the length of the delayed action cam lobe 33. The time of closing can be further modified by altering the tension in the coil spring 25.

My delayed cam action arrangement can also

be used to operate mechanisms other than air valves.

While I have described the details of one form of my invention, I do not wish to be limited to the particular form shown and described as it will be apparent many modifications therein may be made without departing from the scope of my invention.

Having thus described my invention, what I claim is:

1. A cam mechanism comprising; a fixed cam plate rigidly mounted on a shaft, a hub secured to said shaft, an auxiliary cam plate mounted on said hub and adapted to oscillate thereon, a means for limiting the oscillation of said auxiliary cam plate, in respect to said fixed cam plate, a spring tending to hold said fixed cam plate and said auxiliary cam plate in a predetermined position with respect to each other, a cam follower in operative engagement with said fixed cam plate and said auxiliary cam plate; said fixed cam plate adapted to move said cam follower outward radially and said auxiliary cam plate adapted to hold said cam follower in said outward position for a predetermined period after the motion of said fixed cam plate ceases.

2. A cam mechanism comprising; a fixed primary cam plate securely mounted on a shaft, a hub secured to said shaft, an auxiliary cam plate mounted on said hub and adapted to oscillate in axial alignment with respect to said primary cam plate, a resilient member tending to hold said primary and said auxiliary cam plates in a definite position with respect to each other, a cam follower in operative engagement with said primary and said auxiliary cam plates, said fixed primary cam plate adapted to move said cam follower outward radially once during each revolution of said primary cam plate, and said auxiliary cam plate adapted to hold said cam follower in said outward position for a predetermined period after the rotary motion of said primary cam plate ceases.

3. A cam mechanism comprising; a hub, said hub being rigidly secured to a shaft; a primary cam plate interposed between said hub and said shaft; a secondary cam plate mounted on said hub and adapted to oscillate with respect to said primary cam plate, said secondary cam plate having an elongated slot, said primary cam plate being provided with a stop pin arranged to travel in said elongated slot and restrict the travel of said secondary cam plate; a spring tending to hold one end of said slot against said stop pin; a ring adapted to retain said secondary cam plate on said hub, said ring also adapted to adjust the tension in said spring; and a cam follower; said secondary cam plate being provided with a substantial instantaneous rise for contacting said cam follower; said primary cam plate being provided with a lobe for moving said cam follower radially outwardly, whereby secondary cam plate is released and allowed to advance holding said cam follower in said outward position for a predetermined length of time after the rotary movement of said primary cam plate ceases.

4. A cam mechanism comprising; a hub rigidly secured to a crankshaft; a primary cam plate interposed between said hub and said crankshaft; a secondary cam plate mounted on said hub and adapted to oscillate with respect to said primary cam plate, said secondary cam plate having an elongated slot, said primary cam plate having a stop pin arranged to travel in said elongated slot and restrict the travel of said

secondary cam plate, a spring for resiliently holding said secondary cam plate in position against said stop pin; a ring for holding said secondary cam plate on said hub; a cam follower; said cam follower restricting the motion of said secondary cam plate; said primary cam plate having a lobe for moving said cam follower, whereby said secondary cam plate is released and allowed to advance, said secondary cam plate holding said cam follower in said moved position a predetermined length of time after the rotary movement of said primary cam plate ceases.

5. An intermittently rotating cam mechanism comprising; a hub, said hub being rigidly secured to a shaft; a primary cam plate interposed between said hub and said shaft; a secondary cam plate mounted on said hub adjacent said primary cam plate and in axial alignment therewith, said secondary cam plate being provided with an elongated slot, said primary cam plate being provided with a stop pin adapted to travel in said slot and restrict the travel of said secondary cam plate with respect to said primary cam plate; a resilient means for holding said auxiliary cam plate against said pin; a ring for holding said auxiliary cam plate on said hub; a cam follower; said secondary cam plate having a lobe, said cam follower restricting the motion of said secondary cam plate during part of the revolution of said primary cam plate; said primary cam plate having a lobe for moving said cam follower whereby said secondary cam plate is released, said resilient means causing said secondary cam plate to advance after said primary cam plate stops whereby said cam follower is held by said lobe of said auxiliary cam plate after the motion of said cam plate ceases.

6. A cam mechanism comprising; a hub rigidly secured to a shaft; a primary cam plate interposed between said hub and said shaft; a secondary cam plate mounted on said hub, said secondary cam plate being provided with an elongated slot, said primary cam plate being provided with a stop pin adapted to travel in said slot and restrict the motion of said secondary cam plate; a spring for resiliently holding said auxiliary cam plate against said stop pin; a means for holding said auxiliary cam plate on said hub; said means also adapted to vary the tension in said spring; a cam follower; said primary cam plate having a lobe with a sharp rise adapted to move the cam follower radially outwardly, said secondary cam plate being provided with a substantial instantaneous rise; said primary cam plate and said auxiliary cam plate operating as a unit when said shaft begins its rotation and continuing to operate as a unit until said cam follower contacts said lobe of said secondary cam plate, said auxiliary cam plate remaining stationary until said lobe of said primary cam plate moves the cam fol-

lower radially outwardly thereby releasing said auxiliary cam plate whereby said cam follower is held in said outward position by said auxiliary cam plate after the primary cam plate stops until the spring moves said auxiliary cam plate to its normal position against said stop pin.

7. An intermittently rotating cam mechanism comprising; a primary cam plate, an auxiliary cam plate coupled to said primary cam plate for movement therewith but with capacity for limited independent movement with respect thereto, a cam follower in operative engagement with said auxiliary cam plate, said auxiliary cam plate provided with an instantaneous rise adapted to engage with said cam followers whereby the auxiliary cam plate is stopped while the primary cam plate continues to rotate, said primary cam plate provided with a lobe to raise said cam follower to release said auxiliary cam plate, a spring means for moving said auxiliary cam plate with respect to said primary cam plate, said auxiliary cam plate being provided with an elongated lobe for engaging said cam follower after the rotary motion of said primary cam plate ceases whereby the cam follower is held in said raised position after the rotary motion of said primary cam plate ceases, said elongated lobe of said auxiliary cam plate provided with a gradual drop permitting said cam follower to return to its lower position after the motion of said auxiliary cam plate ceases.

8. An intermittently operating cam mechanism adapted to operate in cycles of one revolution comprising; a primary cam plate, an auxiliary cam plate coupled to said primary cam plate for movement therewith but with capacity for limited independent movement with respect thereto, a cam follower in operative engagement with said primary and said auxiliary unit, said cam follower engaging said unit at a low position when said unit begins to rotate during the cycle, said auxiliary cam plate provided with an elongated lobe of substantially instantaneous rise for engaging said cam follower whereby the rotation of said auxiliary cam plate is stopped while said primary cam plate is permitted to continue rotation, said primary cam plate provided with a lobe adapted to raise cam follower onto the elongated lobe of said auxiliary cam plate thereby releasing said auxiliary cam plate, a resilient means for rotating said auxiliary cam plate with respect to said primary cam plate, said motion continuing after the rotation of said primary cam plate ceases whereby said cam follower is held in a raised position after the rotation of said cam plate ceases, said elongated lobe provided with a gradual drop for permitting said cam follower to drop to its lower position when said auxiliary and primary cam unit comes to rest whereby the cam unit is automatically set for another cycle of operation.

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