March 12, 1946. V. C. TAXWOOD 2,396,620

IMPACT TESTING APPARATUS

Filed Oct. 4, 1944 2 Sheets-Sheet 1

Fig. 2.

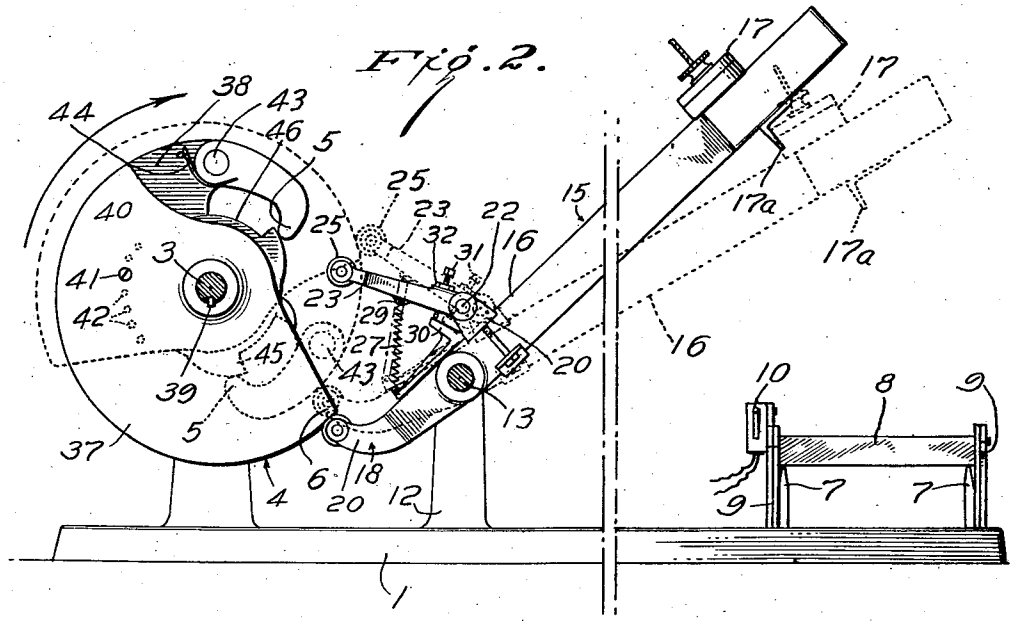


Fig. 3.

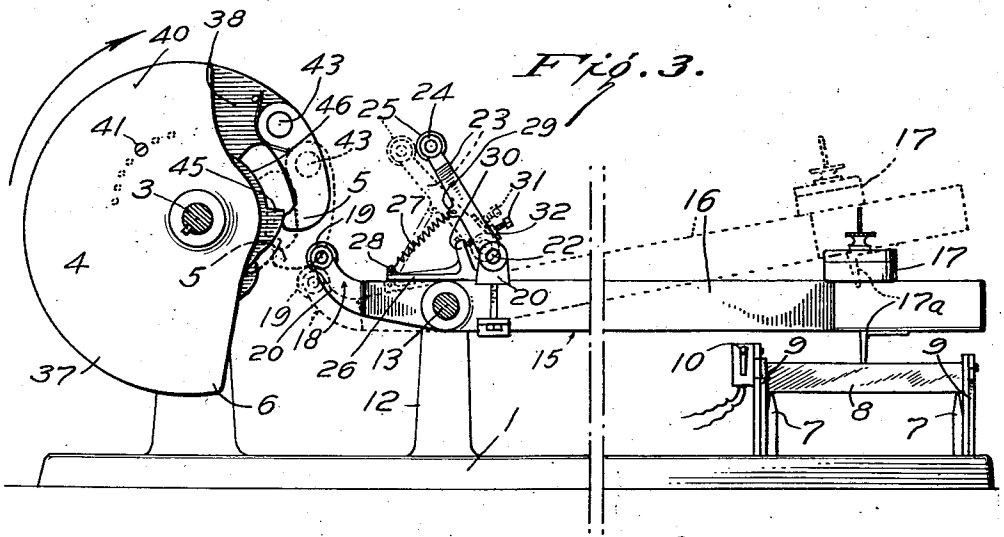
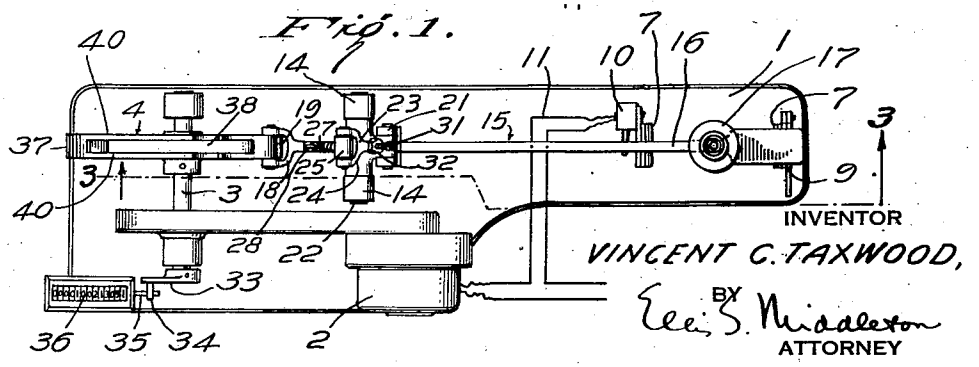


Fig. 1.



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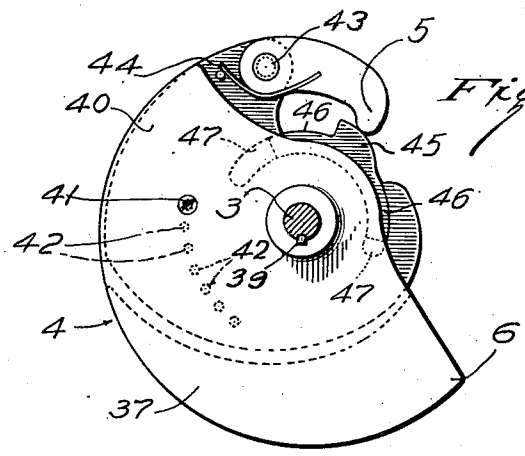
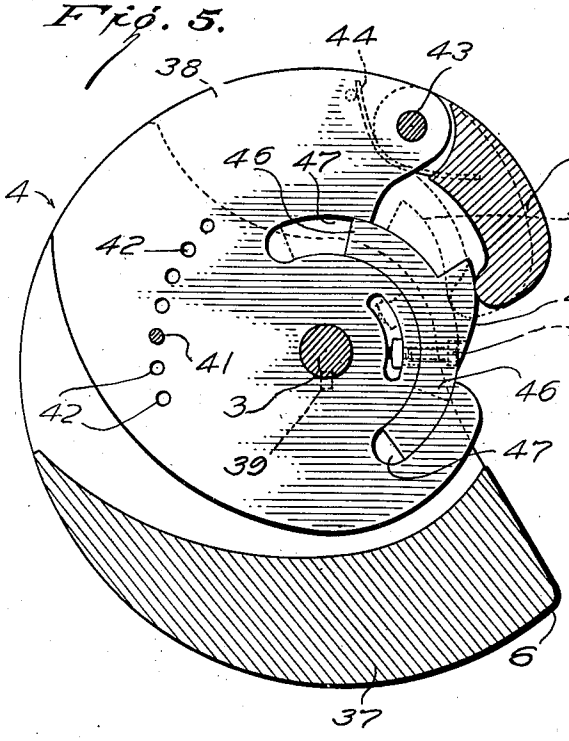


Fig. 7.

Fig. 5.



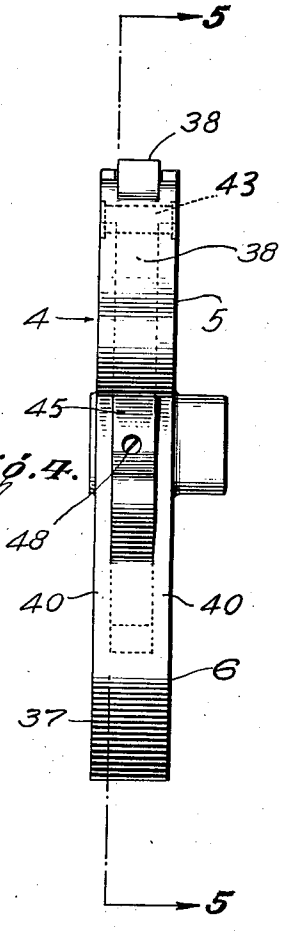
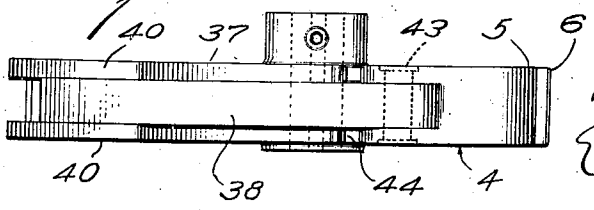


Fig. 4.

Fig. 6.



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IMPACT TESTING APPARATUS

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Application October 4, 1944, Serial No. 557,185

2 Claims. (Cl. 73—12)

The present invention relates to a device for determining the capacity or relative capacity of a test piece to absorb impact blows from a hammer without breaking.

The invention is particularly concerned not only with a device of the type described but also specifically to the structure of an adjustable cam useful therewith and for other purposes.

One object of the present invention is to provide a device of the above character which may be operated for long periods of time without attention, which may be readily adjusted to test pieces having different degrees of resiliency, which will have an automatic cut off device for stopping the machine upon breaking the test piece and which will record the number of impacts absorbed by the test piece without breakage during the test.

In a device of this character where a hammer arm is provided which may be raised a predetermined distance above the test piece and then released to strike the latter, it frequently becomes necessary to rotate the cam at such high speeds as would normally interfere with the free fall of the hammer onto the test piece. One of the principal objects of the invention, therefore, is to provide a cam in such a mechanism which may be readily adjusted so as to avoid interference with the free fall of the hammer under such circumstances.

To this end the invention contemplates a hammer arm pivoted intermediate its length so as to form long and short portions, the former carrying a weighted hammer. A rotatable cam is provided to depress the short end of the hammer arm to raise the hammer to the desired degree. The cam may be provided with a leading edge and a trailing edge with a cut away portion therebetween so that upon rotation and when the hammer is at a predetermined elevation above the test piece through depression of the short portion of the hammer arm, the latter will leave the trailing edge of the cam and due to the cut away portion of the latter the hammer will be permitted to fall against the test piece and without interference from the approaching leading edge of the cam. Means are provided for adjusting the distance in the direction of rotation, between the trailing and leading edges of the cam so as to adjust the effective cut away portion and thus permit the hammer arm to drop onto the test piece without interference.

The invention further includes an adjustable cam having means for adjusting the distance between the leading and trailing edges thereof.

The invention further includes the novel construction, combination and arrangement of parts more fully hereinafter described and shown in the accompanying drawings in which:

Fig. 1 is a plan view of a complete device embodying the present invention.

Fig. 2 is a side view, partly in section, of the complete device showing in full lines the short portion of the hammer arm about to leave the trailing edge of the cam, and in dotted lines, the short portion of the hammer arm soon after its contact with the leading edge of the cam and at the beginning of its downward movement.

Fig. 3 is a side view of the complete device partly in section along the line 3—3 of Fig. 1, showing in dotted lines interference between the leading edge of the cam and the short portion of the hammer arm which prevents impact with the test piece, and in full lines the proper adjustment of the cam so as to permit clearance of the short portion of the hammer arm with the leading edge and impact with the test piece.

Fig. 4 is an edge view of the adjustable cam of the present invention.

Fig. 5 is a plan view partly in section along the line 5—5 of Fig. 4.

Fig. 6 is a top plan view of the cam of Fig. 4.

Fig. 7 is a plan view of a cam constructed according to the present invention in a different adjusted position from that of Fig. 5.

Referring now with particularity to the embodiment illustrated, a base is shown at 1 upon which is mounted an electric motor 2 suitably mechanically connected to a cam shaft 3 carrying a cam generally indicated at 4 in Fig. 1.

The cam is provided with a leading edge 5 and a trailing edge 6 named according to the direction of rotation which from the view point of the drawings is in a clockwise direction.

On base 1 supports 7 are provided on which a test piece 8 may rest. The latter may conveniently be held in position by the fixture 9. On one of the fixtures 9 a switch 10 is mounted and connected to the circuit 11 supplying current to the motor. When the switch 10 is depressed, the circuit to the motor is interrupted and the latter stopped.

Between the test piece holder and the cam is a mount 12 carrying a stub shaft 13 which passes through journals 14 in a hammer arm indicated generally at 15 in Fig. 1. The arm is divided into a long portion 16, carrying a removable weight 17, a contact piece 17a, the latter making contact with the work piece 8 when the hammer is dropped thereon and short portion 18 which ter-

minates in a roller 19 suitably journaled in the bifurcated end 20.

The parts are so arranged that as the cam rotates, the surface of the leading edge 5 will engage the roller 19 and depress the shorter end 18 of the hammer arm, raising the hammer as the cam rotates and the roller 19 approached the trailing edge 6 as shown in Fig. 2, due to the fact that the edge surface of the cam has a generally increasing radii from the leading to the trailing edge thereof.

Suitably mounted on the hammer arm is a carriage 20 having journals 21 in which is mounted a shaft 22 to which a damping arm 23 is pivoted. The upper end of the damping arm is bifurcated as at 24 and carries roller 25. The fixture 20 is provided with an extension 26 having a coil spring 27 secured to an eye 28 at one end thereof and at the other end in an eye 29 on the damping arm 23. The fixture is also provided with an abutment 30 which is engaged by a set screw 31 and lock nut 32 carried by the damping arm.

The cam shaft 3 which carries the cam 4 is provided with a rotatable arm 33 which engages through pin 34 a spring pressed lever 35 on the usual type of counter mechanism 36.

As shown in Figs. 4, 5, 6, and 7, cam 4 consists of a relatively stationary part 37 and a relatively movable part 38. The relatively stationary part 37 is secured to the cam shaft 3 as by keys 39 which, however, do not engage the movable part 38. The movable part 38 is of a thickness considerably less than that of the stationary part 37 and fits closely within the extending walls 40 of the part 37 (Figs. 4 and 6). Screw 41 may be placed within any one of a number of coincident holes 42 in the parts 37 and 38 so as to maintain them in fixed relation to each other. In Fig. 5 the parts 37 and 38 are shown in an extreme opened out position so as to give the narrowest gap between leading edge 5 and trailing edge 6, while in Fig. 7 the parts 37 and 38 are shown in a more collapsed position which gives the widest possible gap between leading edge 5 and trailing edge 6.

The leading edge 5 is constituted by a nose piece pivoted as at 43 to the stationary part 38 with a spring element 44 so arranged as to cause the nose piece to bear against the cam 45 integral with arcuate fixture 46 riding in the slot 47 in the movable part 38. A set screw 48 is used to hold the cam and its arcuate fixture in the desired position. It will be observed that as the cam 45 and its arcuate fixture is moved counterclockwise from the position shown in Fig. 5 the spring 44 will tend to cause the leading edge 5 to ride inwardly toward the cam shaft 3 and thus decrease the radius of the cam at the leading edge.

In operation, the switch 10 (Fig. 3) normally being on and a test piece 8 being in place, the motor 2 rotates the cam clockwise until the leading edge 5 engages the roller 19 as shown in dotted lines in Fig. 2. Further rotation of the cam causes an extreme depression of the shorter portion 18 of the hammer arm until the position shown in full lines in Fig. 2 has been reached. At this point the hammer has been raised to its highest elevation as the roller 19 approaches the trailing edge 6. Further rotation of the cam causes the roller 19 to clear the former and the hammer begins to drop toward the work piece. If the speed of rotation of the cam is too high the leading edge 5 will contact the roller 19 before the contact piece has been able to hit the work piece 8, that is, the parts would appear as in the dotted lines in Fig. 3. Under these circumstances the mechanism would be thrown out of phase. It is apparent that the reason for this interference is that the parts 37 and 38 are not sufficiently separated at the trailing and leading edges, that is to say, the effective cut away portion therebetween is not of an extent sufficient to permit the hammer arm to completely drop. This space may be extended to the proper extent by separating the parts 37 and 38 through manipulation of screw 41 or the arcuate fixture 46 or both as shown in the full lines in Fig. 3 for instance. This adjustment of the parts permits the short end of the hammer arm to raise to the extent required to permit the contact fixture 17a to strike the work piece 8. The cam now being in proper adjustment its rotation may continue without effecting the regular and repeated impacts of the hammer on the work.

When the hammer hits the work piece, the former will rebound a certain extent due to the natural resiliency of the work piece. Further rotation of the cam will cause contact to be made between the leading edge 5 and roller 19 while the hammer arm is on the rebound, at a position such as shown in the dotted lines in Fig. 2. At this point the spring pressed damping arm 23 will have its roller also in contact with the cam surface and due to the tension of the spring, undue vibration of the hammer arm which might otherwise result in excessive wear on the parts is prevented. The cycle is then repeated.

It will be apparent that each rotation of the cam registers its cycle on the counter 36 as shown in Fig. 1 so that the machine may continue for long periods of time without attention after the adjustment has once been made so as to record accurately the number of impacts which the work piece has received.

Upon breaking of the work piece through impact therewith of the contact fixture 17a, the latter will be permitted a further downward movement which causes contact between the longer part of the hammer arm and the switch 10 inasmuch as the path of the former cuts the latter (Fig. 1). Movement of the switch into a down position interrupts the flow of current to the motor and the device stops.

While the invention has been described with particular reference to specific embodiments, yet it is to be understood that the invention is not to be limited thereto, but is to be construed broadly and restricted solely by the scope of the appended claims.

What is claimed:

1. An impact testing device including a hammer arm pivoted intermediate its ends to form a long hammer portion and a short portion, a cam to depress the short portion of the arm and to release the arm when depressed to a predetermined degree, means to hold the test piece to receive the impact of the hammer when the hammer arm is released, the cam having a leading edge and a trailing edge adjustable with regard to each other so as to vary the distance therebetween in which the leading edge includes a pivoted nose piece and means to adjust the nose piece radially.

2. The device of claim 1, the nose piece adjusting means comprising a cam mounted on an arcuate fixture.

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