Sept. 10, 1940. C. SCHULZE 2,214,112

MECHANICAL ACTION FOR MUSICAL INSTRUMENTS

Filed March 21, 1938 2 Sheets-Sheet 1

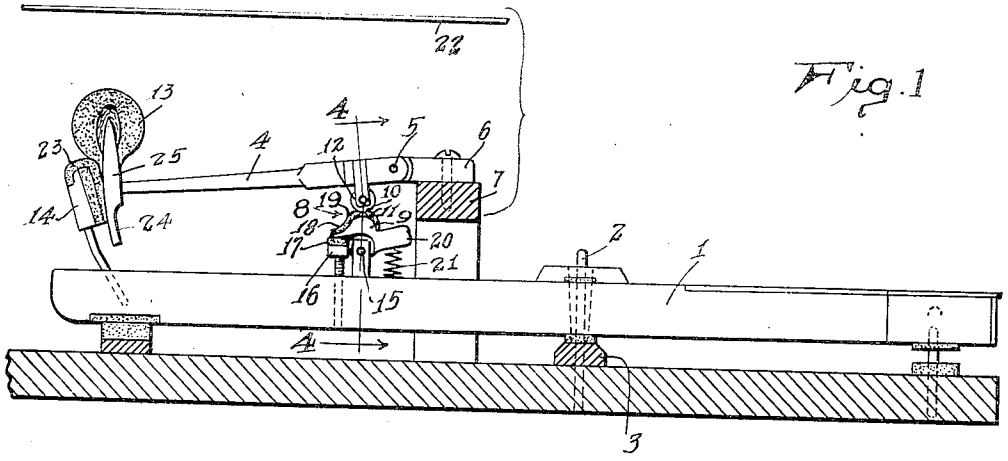


Fig. 1

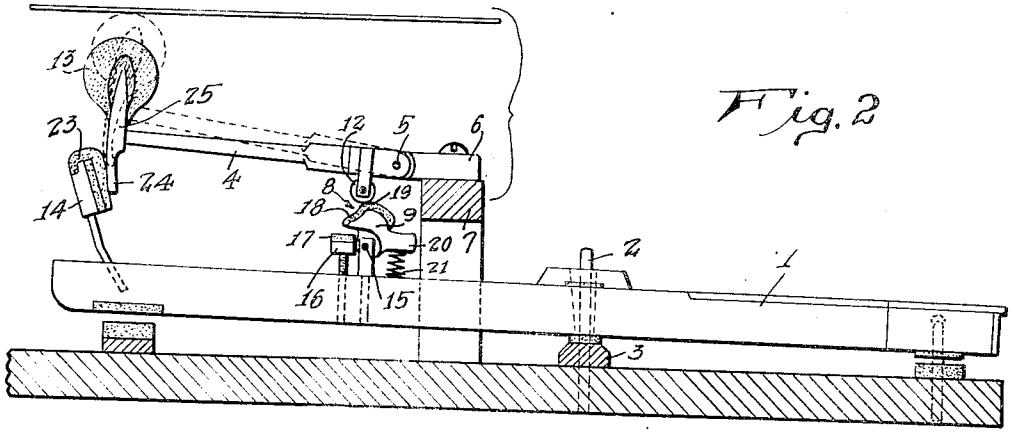


Fig. 2

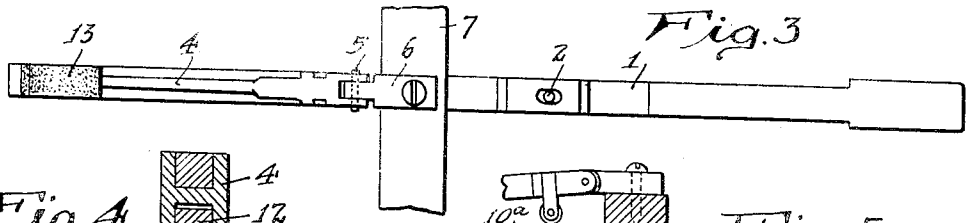


Fig. 3

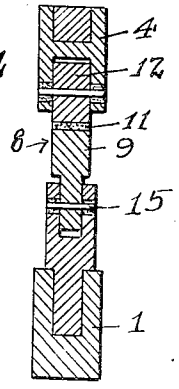


Fig. 4

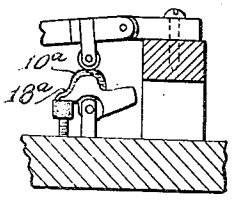


Fig. 5

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MECHANICAL ACTION FOR MUSICAL INSTRUMENTS

Filed March 21, 1938 2 Sheets-Sheet 2

Fig. 6

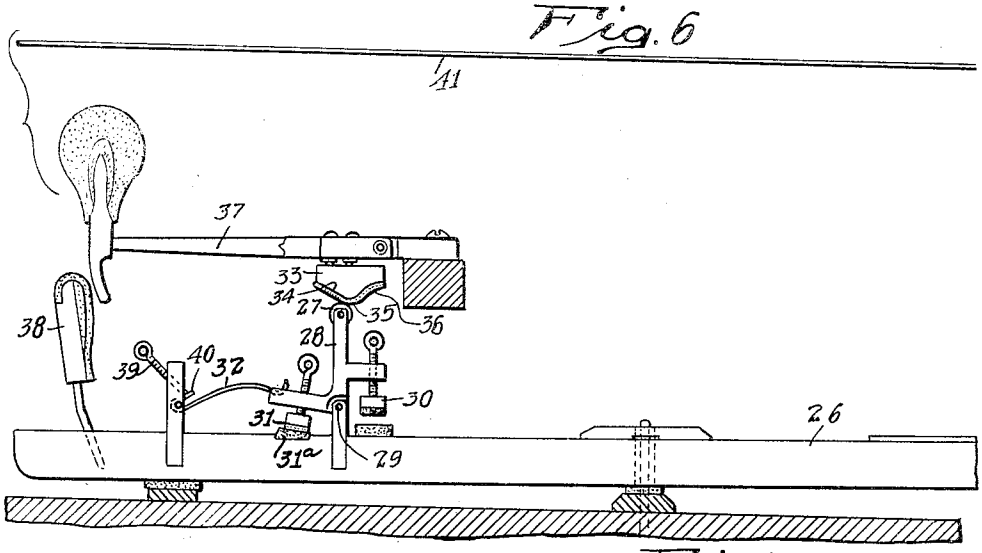


Fig. 7

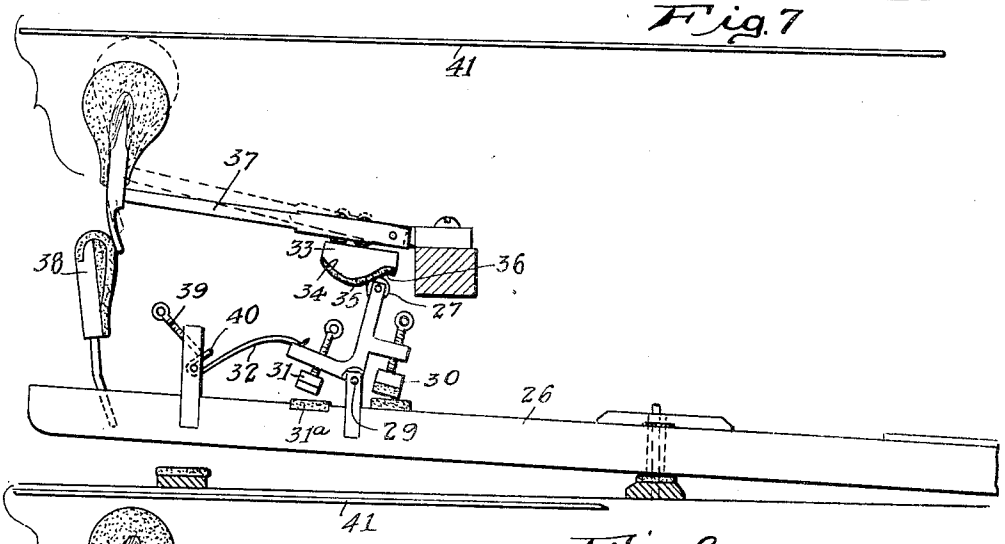
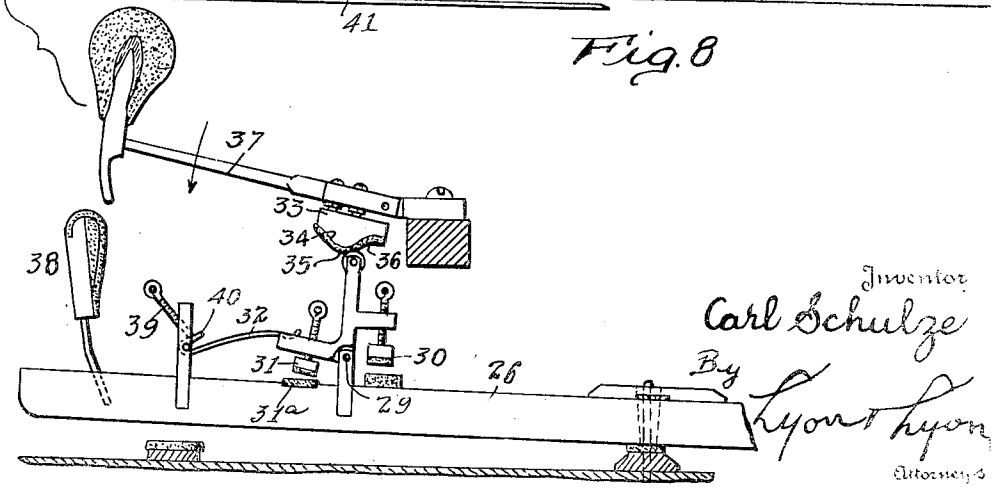


Fig. 8



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2,214,112

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MECHANICAL ACTION FOR MUSICAL INSTRUMENTS

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6 Claims. (Cl. 84—239)

This invention relates to the mechanical action of a musical instrument, and while the improvement may be applied in any kind of musical instrument in which a hammer is made to strike a vibrator to produce a musical note, the invention is expected to have its greatest usefulness in instruments of the piano type. Most of the piano actions heretofore employed, involve the use of a considerable number of parts. This is undesirable as it increases the cost of manufacture and complicates the mode of operation, and increases the tendency of the mechanism to get out or order. Apparently one of the reasons for the complication of piano actions heretofore, is that it has been the general practice to employ a part called a "jack" which is located below or in front of each hammer, and when the piano key is struck, this jack is projected upwardly or rearwardly from the front of the piano to drive the hammer toward the piano strings; and at a certain point in the movement, means known generally as the "set-off" device, comes into operation to shift the end of the jack away from the part on the hammer against which it thrusts, thereby enabling the hammer to drop back in its rebound until its rebounding movement is arrested by the back check that holds the hammer head slightly below or slightly away from the string with which it cooperates.

One of the objects of this invention is to provide a very simple mechanical action for a hammer, such as that of a piano, which will have few parts, and which will operate effectively and in such a way as to permit very rapid repetition of the striking of a key.

One of the objects of the invention is to provide a mechanical action for operating a hammer of this type, which will avoid the necessity for employing a jack, and which consequently avoids the resistance which must be encountered during the depression of the piano key in operating the set-off that shifts the jack out of line with the face against which it is thrust. In this way I produce an action which is very simple in construction and in its mode of operation, and in which no increased resistance is developed at any point against the force which depresses the key.

A further object of the invention is to provide a simple construction of this kind, which will reduce the friction of the contacting parts to a minimum.

In the ordinary piano action involving the use of a jack, it requires considerable force at a certain point in the depression of the key, to shift the jack out of line with the face against which it is thrust. One of the objects of my invention is to avoid the necessity for making any shift in the driving connection between the key or key lever, and the hammer, while the hammer is being impelled toward the vibrator or string, but to provide a construction which, upon the rebound of the hammer, will prevent the connection between the actuating lever and the hammer from interfering with the free return movement of the hammer from the string, which movement is usually arrested by a back-check device associated with the hammer.

Further objects of the invention will appear hereinafter.

The invention consists in the novel parts and combination of parts to be described hereinafter, all of which contribute to produce an efficient mechanical action for musical instruments.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawings:

Fig. 1 is a vertical section through the base board of a piano action, and illustrating the mechanical action, or piano action, embodying my invention. This view shows the parts in the position of rest.

Fig. 2 is a view similar to Fig. 1, but showing the parts in the relation they have when a key has been struck and held down. In dotted lines the position of the hammer is indicated as it strikes the string.

Fig. 3 is a plan of the parts constituting this mechanical action, a portion of the pivoted rail for the hammer, being illustrated broken away.

Fig. 4 is a vertical section taken about on the line 4—4 of Fig. 1 upon an enlarged scale.

Fig. 5 is a fragmentary view similar to Fig. 1, but illustrating an embodiment of the invention that avoids the use of a spring in the drive connection between the actuating lever or key, and the hammer arm.

Fig. 6 is a view similar to Fig. 1, but illustrating another embodiment my invention may take.

Fig. 7 is a view similar to Fig. 6, but illustrating the actuating lever or key completely depressed, and with the back check holding the hammer near the string. This view in dotted lines indicates the position of the hammer in striking the string.

Fig. 8 is a view similar to Fig. 6, but showing the action in full lines with the hammer striking the string.

Before proceeding to a more detailed description of the invention, it should be stated that in practicing the invention I provide a connection between the actuating lever or key, and the arm of the hammer, which operates in such a way that when the key is struck, the driving connection to the hammer arm will be maintained until the hammer head is near the string or vibrator that it is to strike. When the hammer head strikes the string, the hammer instantly rebounds, and in doing so if the key is held depressed, the driving connection will not interfere with the withdrawal of the hammer from the string, thereby permitting the hammer to fall back to the back-check. In order to accomplish this, I provide one of these members with a roller, and the other member with a contact member to cooperate with the roller in imparting the driving movement to the hammer. The roller may be carried by the hammer, or it may be carried by the actuating lever or key. In either case, the presence of the roller greatly reduces the force necessary to actuate the hammer. In the preferred form of the invention, in this driving connection I provide a construction whereby either the roller or the contact member can have a relative movement in addition to their relative movement that is occasioned by the rocking of the actuating lever on its fulcrum. In this way one member is shifted out of line with its cooperating member; for example, in the form of the invention illustrated in Fig. 1, I mount the driving member so that its contact face that engages the roller to drive the hammer forward, can shift out of line with the roller. In the embodiment of the invention illustrated in Figs. 6–8 inclusive, I mount the roller so that it is capable of shifting out of line with the contact face of the contact member during the rebound movement of the hammer. In the embodiment of the invention illustrated in Fig. 5, I do not mount either the roller or the contact member so that a lateral shifting is accomplished, but I provide a relief face on the contact member, which is adjacent to the contact face of the contact member, but the presence of which prevents the contact member from interfering with the free rebound movement of the hammer until it is arrested by the back-check.

In the embodiment of the invention illustrated in Figs. 1–3, I provide an actuating lever which, in the present instance, is a key 1, said key being mounted for rocking movement on a fulcrum pin 2 set in the usual fulcrum rail 3. The rear end of the key 1 extends longitudinally under the hammer arm 4. The hammer arm 4 is supported on the usual horizontal pivot 5 carried by a hammer block 6, which is adjustably secured on the upper side of the hammer rail 7.

In practicing the invention, I provide a driving connection 8 between the inner portion of the key 1 and the hammer arm 4 near its pivotal support 5.

The driving connection 8 includes a roller and a contact device. Either the lever 1 or the hammer arm 4, carries the roller; and either the hammer arm 4 or the lever 1, carries the contact member. In the present instance I illustrate a contact member 9 supported on the rear portion of the key 1, and this contact member has a contact face including a driving face 10 which is preferably the upper face of a small pad 11 of felt, or similar yielding material. On this face 10 a roller 12 rests, said roller being pivotally supported on the hammer arm 4. In the operation of the action, I provide for a lateral shifting of the contact face 10 of the connection 8, which may be occasioned during the rebound of the hammer, the mode of operation being such that the contact member 9 will not prevent the hammer head 13 from rebounding or falling back and engaging the usual back-check 14 carried by the actuating lever. In the present instance, the contact member 9 is in the form of a small rocking block, or rocker, mounted for pivotal movement on a pin 15 supported above the key 1. The forward end of this block preferably projects over an adjustable stop 16 preferably provided with a pad 17 to contact the block. The block is formed so that the pad 11 presents a relief face 18 on the side thereof removed from the forward end of the key 1, with a shoulder 19 formed between it and the driving face 10. The relief face 18 is preferably slightly concave, as shown in Fig. 1, and merges into the driving face 10 at the shoulder 19. The forward side of the rocker 9 is preferably formed as an extension 20 that projects over a small coil spring 21. In other words I provide resilient means mounted in any suitable manner to cooperate with the rocker 9 and tending to rock it in a direction to hold it against the stop 16. In the position of the key shown in Fig. 2, this spring maintains contact between the contact member and the roller.

When the key 1 is struck, of course, its rear end rises in the usual way and force is imparted through the connection 8 to the hammer arm 4, causing it to move toward the vibrator or string 22 with which the hammer cooperates. The construction is such that when the key 1 is completely depressed, the hammer 13 will be quite close to the string 22 preferably about one-eighth of an inch. When the hammer head 13 strikes the string, the hammer rebounds and the rebounding movement is arrested by the back-check as illustrated in Fig. 2. By reason of the relief face 18 the roller 12 will engage the side of the shoulder 19 instead of the driving face 10 of the rocker, and hence the rocker will not prevent the return of the hammer to be stopped by the back-check, but the instant pressure on the key ceases and the key starts to rise, the spring rocks the block so as to bring the driving face 10 under the roller. In the form of the invention illustrated in Fig. 5, there is, of course, no lateral movement of the contact face 10*a*, but the relief face 18*a* (see Fig. 5) will enable the hammer head to drop back to the back-check.

The back-check 14 is of any suitable construction, preferably constructed so as to hold a pad 23 with its inclined face just below the tail 24 of the body 25 that carries the hammer head 13.

In the embodiment of the invention illustrated in Figs. 6–8, the roller is not carried by the hammer arm but is carried by the key 26. In this construction the roller 27 is carried on a rocker 28 pivotally mounted on a pivot pin 29 on the upper side of the key 26. This rocker 28 is preferably provided with two padded adjustable stops 30 and 31, and resilient means is provided such as a leaf spring 32, for urging the rocker 28 against the stop pad 31*a*, that is to say, the rocker is urged in a direction away from the forward end of the key 26 and toward the hammer head.

In this construction the contact member **33** is in the form of a block having a contact face or driving face **34** which is somewhat inclined to the horizontal line, that is to say, in an upward direction toward the hammer head and away from the roller **27**. Toward the right of the contact member **33** and away from the hammer head, a shoulder **35** is provided, and beyond this shoulder a relief face **36** is provided. The shoulder and the relief face preferably form an ogee curve. In this embodiment of the invention when the key is struck, the rocker **28** will impart force to the hammer **37**, driving the same against the string **41**. Before the hammer reaches the string, contact will be broken between the roller **27** and the contact face **34** in the vicinity of the shoulder **35**, and when the hammer rebounds, the inclined side of the shoulder adjacent the relief face **36** will engage the roller and cause the rocker **28** to move the roller out of line with the contact face and the shoulder **35**, thereby enabling the hammer to drop back to the back-check **38**.

If desired, the spring **32** can be provided with an adjusting screw **39** that thrusts against the stub tail **40** on the spring **32**. Evidently by tightening up the adjusting screw **39**, the resistance or force exerted by the spring **32** can be increased. Fig. 8 illustrates this relation of the parts and shows the hammer in the position immediately after it has struck the string **41** and is rebounding. Of course, the spring **32** offers a slight resistance to the rebound of the hammer, and cushions it in its movement into contact with the back-cehck.

It is understood that the embodiment of the invention described herein is only one of the many embodiments this invention may take, and I do not wish to be limited in the practice of the invention, nor in the claims, to the particular embodiment set forth.

What I claim is:

1. In a mechanical action for striking a vibrator of a musical instrument, the combination of a pivoted hammer, an actuating lever for the hammer mounted to rock upon a fulcrum, one of said parts having a roller and the other of said parts having a contact member with a driving face engaging the roller when the action is at rest, and cooperating with the roller to drive the hammer toward the vibrator, said contact member also having a relief face adjacent the driving face, means for mounting said roller and said contact member so that one of them is laterally movable bodily with respect to the other independently of the relative movement occurring when the actuating lever rocks on its fulcrum, all of said parts cooperating when the actuating lever is struck, to drive the hammer against the vibrator, so that if the key is held depressed the rebounding hammer operates to throw the roller and driving face out of line with each other, and effect an engagement between the roller and the said relief face, resilient means associated with the roller and the contact member exerting its force in a direction to bring the roller and the driving face back into engagement with each other; and back check means operating to support the hammer at an intermediate point in its return travel.

2. In a mechanical action for striking a vibrator of a musical instrument, the combination of a pivoted hammer, an actuating lever for the hammer, one of said parts having a roller and the other of said parts having a contact member cooperating with the roller to drive the hammer toward the vibrator, means for pivotally mounting the contact member on the actuating lever to move relatively to the acuating lever, said contact member having a driving face and a relief face merging into the driving face, all of said parts cooperating when the actuating lever is struck to drive the hammer against the vibrator, so that the rebounding hammer operates to effect engagement of the roller and the contact member at the relief face and thereby rock the contact member so that its driving face is out of line with the roller; and back-check means operating to support the hammer at an intermediate point in its rebound.

3. In a mechanical action for striking a vibrator of a musical instrument, the combination of a pivoted hammer, an actuating lever for the hammer, one of said parts having a roller and the other of said parts having a contact member cooperating with the roller to drive the hammer toward the vibrator, means for pivotally mounting the contact member on the actuating lever, said contact member having a driving face and a relief face adjacent the driving face and forming an extension thereof, all of said parts cooperating when the actuating lever is struck, to drive the hammer against the vibrator, so that the rebounding hammer operates to effect engagement of the roller and the contact member at the relief face and thereby rock the contact member so that its driving face is out of line with the roller, a spring associated with the contact member for rocking the same to return the driving face into line with the roller when the pressure on the actuating lever is relieved, for repeating the actuation of the hammer; and back-check means operating to support the hammer at an intermediate point in its rebound.

4. In a mechanical action for striking a vibrator of a musical instrument, the combination of a pivoted hammer, an actuating lever for the hammer, a rocker pivotally supported on the lever, a roller carried by the rocker, a contact member carried by the hammer to cooperate with the roller, said contact member having a driving face in contact with the roller when the parts are at rest and having a relief face adjacent to the driving face and merging into the same, all of said parts cooperating when the actuating lever is struck, to drive the hammer against the vibrator so that the rebounding hammer operates to effect engagement of the relief face with the roller, and thereby rock the rocker so that the roller is out of line with the driving face and will not support the rebounding hammer; back-check means operating to support the hammer at an intermediate point in its rebound, and resilient means associated with the rocker for moving the same to bring the roller into line with the driving face as soon as the pressure on the actuating lever ceases.

5. In a mechanical action for striking a vibrator of a musical instrument, the combination of a pivoted hammer, an actuating lever for the hammer, a rocker pivotally supported on the lever, a roller carried by the rocker, a contact member carried by the hammer to cooperate with the roller, said contact member having a driving face in contact with the roller when the parts are at rest and having a relief

face adjacent to the contact face, all of said parts cooperating when the actuating lever is struck, to drive the hammer against the vibrator so that the rebounding hammer operates to effect engagement of the relief face with the roller, and thereby rock the rocker so that the roller is out of line with the driving face and will not support the rebounding hammer; back-check means operating to support the hammer at an intermediate point in its rebound, resilient means associated with the rocker for moving the same to bring the roller into line with the driving face as soon as the pressure on the actuating lever ceases, and adjustable stops associated with the rocker for limiting its rocking movement in both directions.

6. In a mechanical action for striking the vibrator of a musical instrument, the combination of a pivoted hammer, an actuating key for the hammer, a roller carried by the hammer adjacent the pivot of the hammer, a contact member pivotally mounted on the key under the roller, said contact member having a driving face in contact with the roller when the parts are at rest, and having a relief face adjacent the contact face, said parts cooperating when the actuating key is struck to drive the hammer against the vibrator so that the rebounding hammer operates to effect engagement of the roller with the relief face and thereby rock the rocker to move its driving face out of line with the roller; back-check means operating to support the hammer at an intermediate point on its rebound, and a spring associated with the rocker to rock the same as soon as the pressure on the key is relieved, to bring the driving face under the roller near the position in which it was supported by the back-check means.

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