June 29, 1926. 1,590,269

C. B. WADE

AUTOMATIC SAFETY DEVICE FOR PNEUMATIC HAMMERS

Filed March 22, 1924 2 Sheets-Sheet 1

Fig. 1.

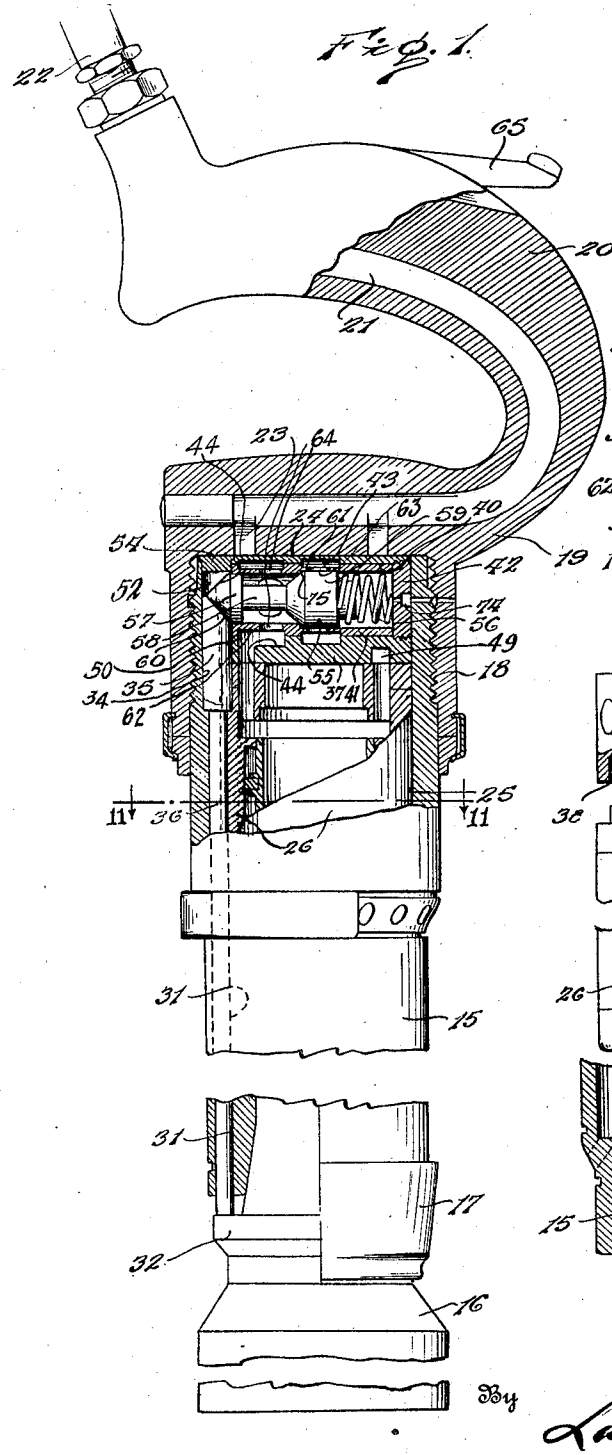


Fig. 10

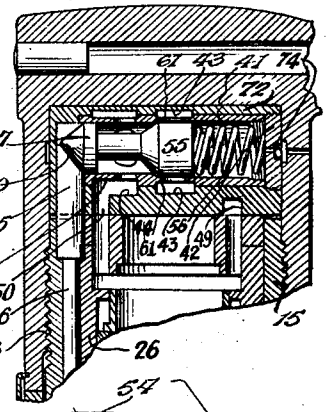
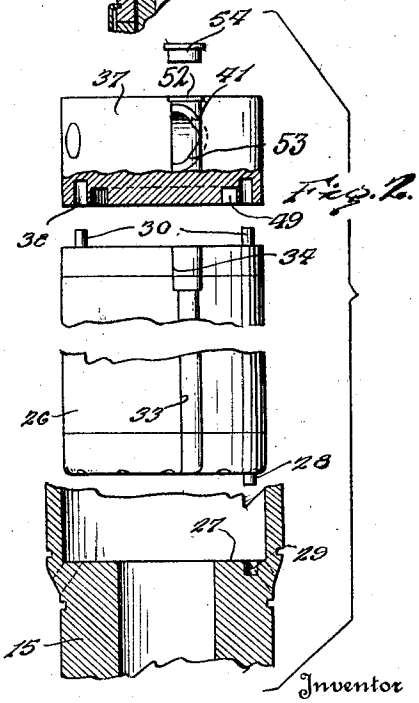


Fig. 2.



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Filed March 22, 1924 2 Sheets-Sheet 2

Fig. 3.

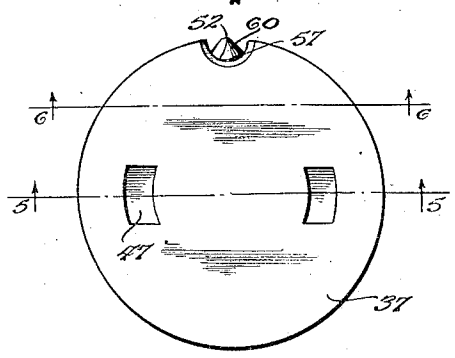


Fig. 4.

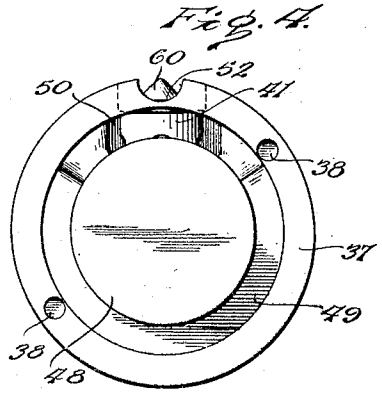


Fig. 5.

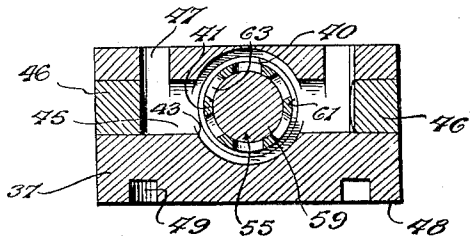


Fig. 7.

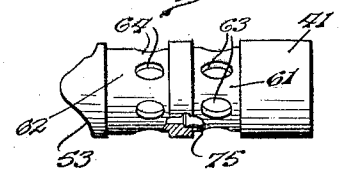


Fig. 8.

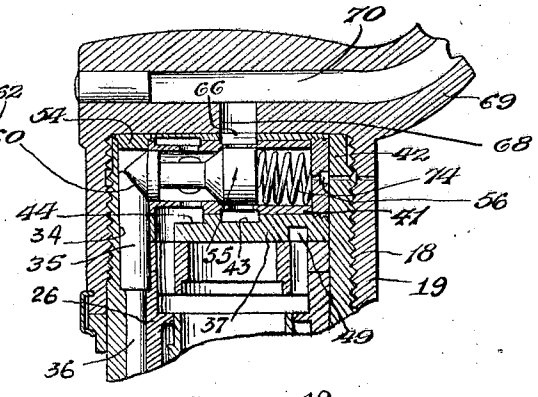


Fig. 6.

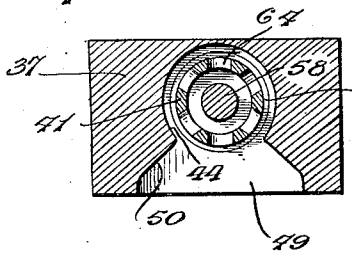
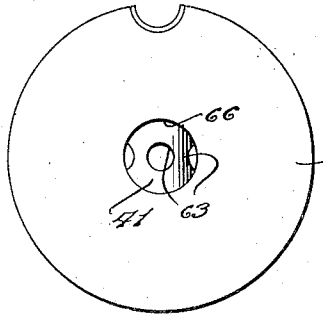


Fig. 9.



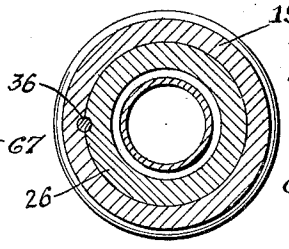


Fig. 11.

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Patented June 29, 1926. 1,590,269

UNITED STATES PATENT OFFICE.

CHARLES B. WADE, OF ROANOKE, VIRGINIA.

AUTOMATIC SAFETY DEVICE FOR PNEUMATIC HAMMERS.

Application filed March 22, 1924. Serial No. 701,159.

My invention relates to a safety device used on pneumatic hammers of any description such as riveting, calking and chiseling hammers, and the like.

In hammers of this class, the bit inserted at the operating end of the hammer fits loosely therein so that in case the pressure on the bit is momentarily released while the trigger is still held to admit pressure fluid into the hammer, it often happens that the bit is thrown out violently from the hammer, thereby causing serious accidents.

The main object of the present invention is to furnish an automatic safety device which closes the inlet port for the pressure fluid into the pressure chamber of the hammer immediately the bit is moved away from the work independently of whether the trigger actuating the throttle for admitting pressure fluid into the hammer is released or not. Accordingly, the plunger in the hammer will immediately be stopped and not driven against the bit so that the latter cannot fly out from its seat.

In some pneumatic hammers of late construction an operating rod is furnished abutting the collar on the bit at one end and at the opposite end in contact with a valve which controls the inlet port in the air pressure chamber. This valve is installed in axial alinement with the operating rod with the consequence that the pressure fluid will act directly on the contacting end thereof and push the rod hard against the bit, and the operator will have to overcome this additional pressure when he applies the hammer against the work.

This disadvantage is entirely removed from the safety device forming the subject matter of the present invention, so that the operator does not have to use more force than with an ordinary pneumatic hammer without such safety device.

In the accompanying drawings, Figure 1 is a fragmentary side elevation and partial axial section of the hammer with a preferred construction of the safety device;

Figure 2 is a side elevation and partial section of some of the details;

Figure 3 is a top plan view of the casing or valve block containing the main parts of the safety device;

Figure 4 is a bottom plan view of the same;

Figure 5 is a vertical section along line 5—5 of Fig. 3;

Figure 6 is a similar section along line 6—6 of Fig. 3;

Figure 7 is a side elevation of a bushing for said casing.

Figure 8 is a fragmentary vertical section of the hammer with a slightly modified form of safety device;

Figure 9 is a top plan view, corresponding to Fig. 3, of the casing used in the modified form shown in Fig. 8, and

Figure 10 is a fragmentary sectional view of the upper end of the hammer showing still another modification.

Fig. 11 is a detail section on the line 11—11 of Fig. 1.

In the drawings, reference numeral 15 represents the cylinder of a pneumatic hammer and 16 is a bit mounted in the usual manner in the lower end of the cylinder 15 and retained therein by a clip 17 permitting a slight reciprocation of the bit in relation to the cylinder. The upper end of the cylinder 15 is threaded as at 18 in order to receive a head 19. This head is provided with a conventional handle 20 in which a fluid pressure passage 21 containing the usual throttle valve connects a supply hose 22 with a groove or port 23 opening through the flat roof 24 of the head into the working cylindrical pressure chamber 25 of the hammer. In the upper end of the cylinder is the usual sleeve 26 which fits tightly on the shoulder 27 in the pressure chamber and houses the plunger, the pressure fluid exhausting from the sleeve in the usual manner. In order to accurately seat the sleeve in the cylinder 15 and prevent it from turning, the lower end of the sleeve is provided with a dowel 28 adapted to engage a corresponding recess 29 furnished in the shoulder 27 of the cylinder. The upper end of the sleeve is similarly provided with dowels 30, the functioning of which will be described later. The construction thus far described is well-known and constitutes no part of my present invention.

Along one side of the cylinder 15 is formed a tubular guide 31 extending the entire length thereof and opening at its lower end above a collar 32 on the bit 16. Above the shoulder 27 the guide is continued; half of it, as at 33, being furnished

in the side of the sleeve 26, see particularly Fig. 2. The upper end of this guide is enlarged, as at 34, to accommodate the head 35 on the actuating rod 36 which fits slidably in the guide with its extreme lower end resting upon the collar 32 of the bit 16.

As indicated in Fig. 1, the upper end of the cylinder 15 continues above the top end of the sleeve 26, and in the end of the cylinder between the end of the sleeve and the roof 24 of the head 19 is inserted a cylindrical plug or valve block 37 with flat top and bottom sides, the bottom side of which is provided with apertures 38 adapted to engage the dowels 30 on the sleeve. In this manner the valve block 37 is prevented from turning and it is also held firmly between the roof 24 and the top of the sleeve, as clearly shown in Fig. 1.

The valve block is provided with a cylindrical bore 40 running transversely to the longitudinal axis of the valve block which coincides with the axis of the chamber 25. In the bore 40 is inserted a bushing 41 which fits tightly therein, and one end of the bore is closed by a cap 42 preferably threaded in to the valve block against the end of the bushing. Concentric with the bore 40 are provided two counterbores or annular grooves 43 and 44 the former of which is positioned centrally therein, that is to say, substantially in the axial plane of the valve block and the cylinder 15. The other groove 44 is adjacent the open end of the bore. Intersecting at right angles with the bore 40 is drilled a transverse passage 45 the open ends of which are closed by tight fitting plugs 46. From this transverse passage extend upwardly to the top face of the housing 37, two ports 47 adapted to register with the ports 23 in the hammer head 19. In the bottom face 48 of the valve block 37 is cut an annular groove 49, the outer diameter of which is substantially the same as the distance between the outer walls of the ports 47 in the top of the block. In order to establish communication between this annular groove 49 and the transverse bore 40 a passage 50 is provided between the two, see particularly Figs. 4 and 6. The enlarged portion 34 of the guide 31 is preferably continued upwardly as at 52 through the valve block 37, half of this extension 52 being cut in the valve block and the other half in the cylinder 15. Depending on the length of the bushing 41 the inner end of the latter will also be cut out, as at 53, in Fig. 7, in order that the head 35 of the actuating rod 36 will be able to freely reciprocate in the guide. In order to facilitate manufacture, the guide extension 52 is preferably cut through the top of the valve block 37, as seen in Figs. 1, 2 and 3 and the open end of the guide is then closed by a tight fitting plug 54 driven into the guide between the wall thereof and the valve block 37. The reason for furnishing this plug 54 is to provide an abutment for the upper end of the head 35 of the actuating rod to limit its upward movement.

In the bushing 41 is mounted to reciprocate a valve plunger 55 between which and the cap 42 is inserted a compression spring 56, see Fig. 1. This plunger has a head 57, a neck 58 and a base 59, all integral parts. A seat 75 is furnished in the bushing 41 for the tapered end of the base 59 of the valve plunger 55. This forms a tight joint when the valve plug is pressed into the seat by the spring 56, thus preventing all leakage forward of the base, that is to say, from the inlet ports 63 to the outlet ports 64. In order to take care of any leakage to the rear of the valve plunger and permit escape of air which would otherwise be compressed by the opening movement of the valve and prevent its complete opening, a small air vent or exhaust passage 74 is provided in the cap 42 and continued through the walls of the cylinder 15 and the head 19. The head 57 has a tapered nose 60 adapted to register with the correspondingly beveled upper end of the actuating rod head 35, as best seen in Fig. 1.

The bushing 41 is provided with two external annular grooves 61 and 62, shown most clearly in Fig. 7, which register with the annular grooves 43 and 44 respectively in the valve block. Communicating with the interior of the bushing 41 are radial ports 63 and 64 in the grooves 61 and 62 respectively formed, through the wall of the bushing 41. The relative positions of these ports are such that when the plunger valve 55 is in a closed position, as indicated in Fig. 1, the ports 63 will be closed by the base 59 of the plunger while the ports 64 remain constantly open whether the valve is in forward or retracted position.

The operation of the device is as follows: During transportation or when the hammer is not in actual use, the position of the parts is as shown in Fig. 1, that is to say, the bit 16 is in its outermost position and the actuating rod 36 rests with its lower end against the collar 32. This is caused by the pressure of the spring 56 against the plunger valve 55 whereby the bevel nose 60 compels the bevel head 35 to move downwardly. It will be evident that even if the trigger 65 be pressed down to open the throttle valve in the passage 21, thereby admitting pressure fluid into the ports 23, this pressure fluid can pass no further because the base 59 of the valve plunger 55 closes upon the seat 75 and across the ports 63 in the bushing. Directly the bit is pressed against the work, the collar 32 will push the actuating rod 36 upwards in its guide 31 so that the upper beveled end of the rod will move

across the end of the plunger 55 and force the latter from its seat 75, against the pressure of the spring 56, opening the ports 63. The pressure fluid will then flow through the ports 23 and 47 into the transverse opening 45, and thence around the annular groove 43, through the ports 63 and past the seat 75. It then passes along the neck 58 of the plunger valve and out through the ports 64 and opening 50 into the bottom groove 49 in the valve block, whence it enters the sleeve 26 to actuate the hammer plunger or piston in the usual manner.

In Figs. 8 and 9 is shown a modification consisting in providing a central aperture 66 in the valve block 67 instead of the two side ports 47, although obviously all three ports may be used if desired. To register with this central aperture 66, a corresponding aperture 68 is provided in the head 69 communicating with the fluid pressure passage 70 in the latter. The operation of this modified device is identical with that of the preferred form of the device, the only difference being that the pressure fluid enters centrally into the bushing 71.

In Fig. 10 is shown still another modification differing from the two forms already described only by providing a valve block 72 of a diameter corresponding to the threads 18 on the cylinder 15. In this case the hammer head 19 may be built slightly longer so that the block 72 rests, as before, on top of the sleeve 26 which projects slightly above the threaded end of the body cylinder 15, as indicated in this figure.

The main reason for furnishing a bushing is to facilitate repairs as the bushing is exposed to constant wear and it is evident that, depending upon the material used for the valve block, the valve plunger 55 may be inserted directly into a bore furnished in the block without the intermediary of a bushing.

It is also evident that in some cases the head 19 itself may be constructed to receive the valve plunger 55 although such construction would somewhat increase the cost of manufacture and prevent easy replacement of parts. As shown in the drawings, it will be clearly understood that this safety device can be applied very easily to existing hammers as all the parts needed for the same are included in the valve block 37 with the exception of the actuating rod 36 for which the guide 31 would have to be drilled in the hammer body.

The term "bit" in the specification and claims is intended to include any kind of punch, rivet set, chisel or other specific tool operated by a pneumatic hammer.

From the above description and the showing of the accompanying drawings it will be evident that this device has still another advantage, namely, that it is immaterial in what angular position the head engages the threaded upper end of the cylinder, because the valve block 37 is keyed in the chamber 25 through the intermediary of the sleeve 26, which will always cause the guide portion 52 in the block to register with the corresponding guide portion in the cylinder 15.

Having thus described the invention, what is claimed as new is:

1. The combination with a pneumatic hammer including a cylinder, a bit mounted in one end of the cylinder and a handle at the opposite end of the cylinder having a passage for conveying pressure fluid to the cylinder, of a controlling valve mounted transversely to the cylinder between the same and the handle, yieldable means holding the controlling valve normally in closed position to cut off flow of pressure fluid to the cylinder, and a slidable actuating rod mounted longitudinally in the cylinder with one end in contact with but free of the bit and its opposite end bearing freely against the end of the controlling valve in opposition to said yieldable means whereby to open said controlling valve when the bit is pressed against the work.

2. The combination with a pneumatic hammer including a cylinder, a bit mounted in one end of the cylinder, and a handle at the opposite end of the cylinder having a passage for conveying pressure fluid to the cylinder, of a plunger valve mounted slidably across one end of the cylinder between the same and the handle, an expansion spring bearing against one end of said valve to hold the valve normally in closed position cutting off flow of pressure fluid, and a slidable actuating rod mounted longitudinally in the wall of the cylinder with one end bearing upon the end of the plunger valve remote from the spring and acting in opposition to the spring and its opposite end in contact with the bit whereby to open said valve when the bit is pressed against work.

3. The combination with a pneumatic hammer including a cylinder, a bit mounted in one end of the cylinder, and a handle at the opposite end of the cylinder having a passage for conveying pressure fluid to the cylinder, of a plunger valve mounted slidably across one end of the cylinder between the same and the handle, an expansion spring bearing against one end of said valve to hold the valve normally in closed position cutting off flow of pressure fluid, the opposite end of said valve being beveled, and a slidable actuating rod mounted longitudinally in the wall of the cylinder with one end beveled and bearing upon the beveled end of the plunger valve and acting in opposition to said spring and its opposite end in contact with the bit whereby to open said valve when the bit is pressed against work.

4. The combination with a pneumatic

hammer including a cylinder, a bit mounted in one end of the cylinder, a handle at the opposite end of the cylinder having a passage for conveying pressure fluid to the cylinder, and a sleeve in the cylinder, of a valve block held fixedly in the end of the cylinder by and between the handle and the sleeve, a controlling valve mounted slidably in the valve block transversely to the cylinder, yieldable means housed in the valve block and acting on said valve to hold it normally closed to cut off flow of pressure fluid, and an actuating rod mounted slidably longitudinally between the walls of the cylinder and the sleeve with one end bearing upon the controlling valve in opposition to said yieldable means and its opposite end in contact with the bit whereby to open said valve when the bit is pressed against work.

5. The combination with a pneumatic hammer including a cylinder, a bit mounted in one end of the cylinder, a handle at the opposite end of the cylinder having a passage for conveying pressure fluid to the cylinder, and a sleeve in the cylinder, of a valve block held in the end of the cylinder by and between the handle and the sleeve and having inlet, dowels on the ends of the sleeve engaging in apertures in the body of the cylinder and in the lower side of the valve block respectively whereby to lock the valve block against turning, a controlling valve mounted slidably in the valve block transversely to the cylinder, yieldable means housed in the valve block and acting on said valve to hold it normally closed to cut off flow of pressure fluid, and an actuating rod slidably mounted longitudinally between the walls of the cylinder and the sleeve with one end bearing upon the controlling valve in opposition to the yieldable means and its opposite end in contact with the bit whereby to open said valve when the bit is pressed against work.

6. The combination with a pneumatic hammer including a cylinder, a bit mounted in one end of the cylinder, and a handle at the opposite end of the cylinder having a passage for conveying pressure fluid to the cylinder, of a slidable controlling valve mounted transversely to the cylinder between the same and the handle, yieldable means acting upon one end of said valve to hold the same normally in closed position cutting off flow of pressure fluid to the cylinder, and means mounted upon the cylinder operatively engaged with the bit and said valve and acting upon said valve in opposition to said yieldable means whereby to open the valve when the bit is pressed against work.

7. The combination with a pneumatic hammer including a cylinder, a bit mounted in one end of the cylinder, and a handle secured on the opposite end of the cylinder and having a passage for conveying pressure fluid to the cylinder, of a valve block secured in the last-mentioned end of the cylinder against the handle and provided with ports in its top communicating with the passage in the handle, an outlet in the bottom of the valve block for discharging fluid into the cylinder, and a diametrical bore in communication with said ports and said outlet, a valve slidably mounted in said bore and having a tapered head at one end, yieldable means for holding the valve normally across the ports in the top of the valve block with its tapered head projecting through the side of the block, and a rod slidably mounted in the wall of the cylinder with one end resting against the bit and its opposite end tapered and resting upon the tapered head of the valve whereby to actuate the valve in opposition to the yieldable means when the bit is pressed to its work.

In testimony whereof I affix my signature.

CHARLES B. WADE. [L. S.]