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HEAT EXCHANGE APPARATUS

Filed Dec. 27, 1948

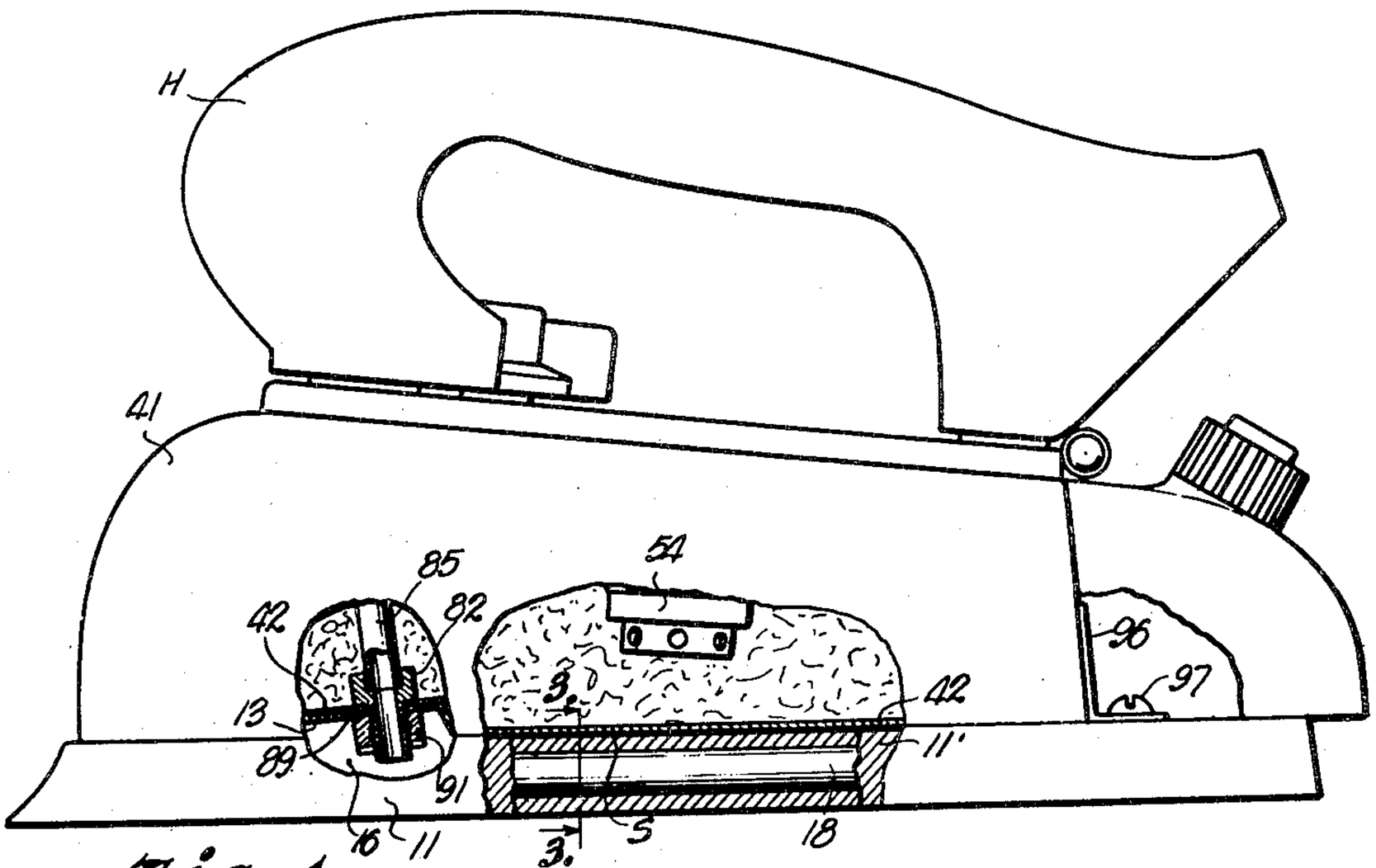

Fig. 1.

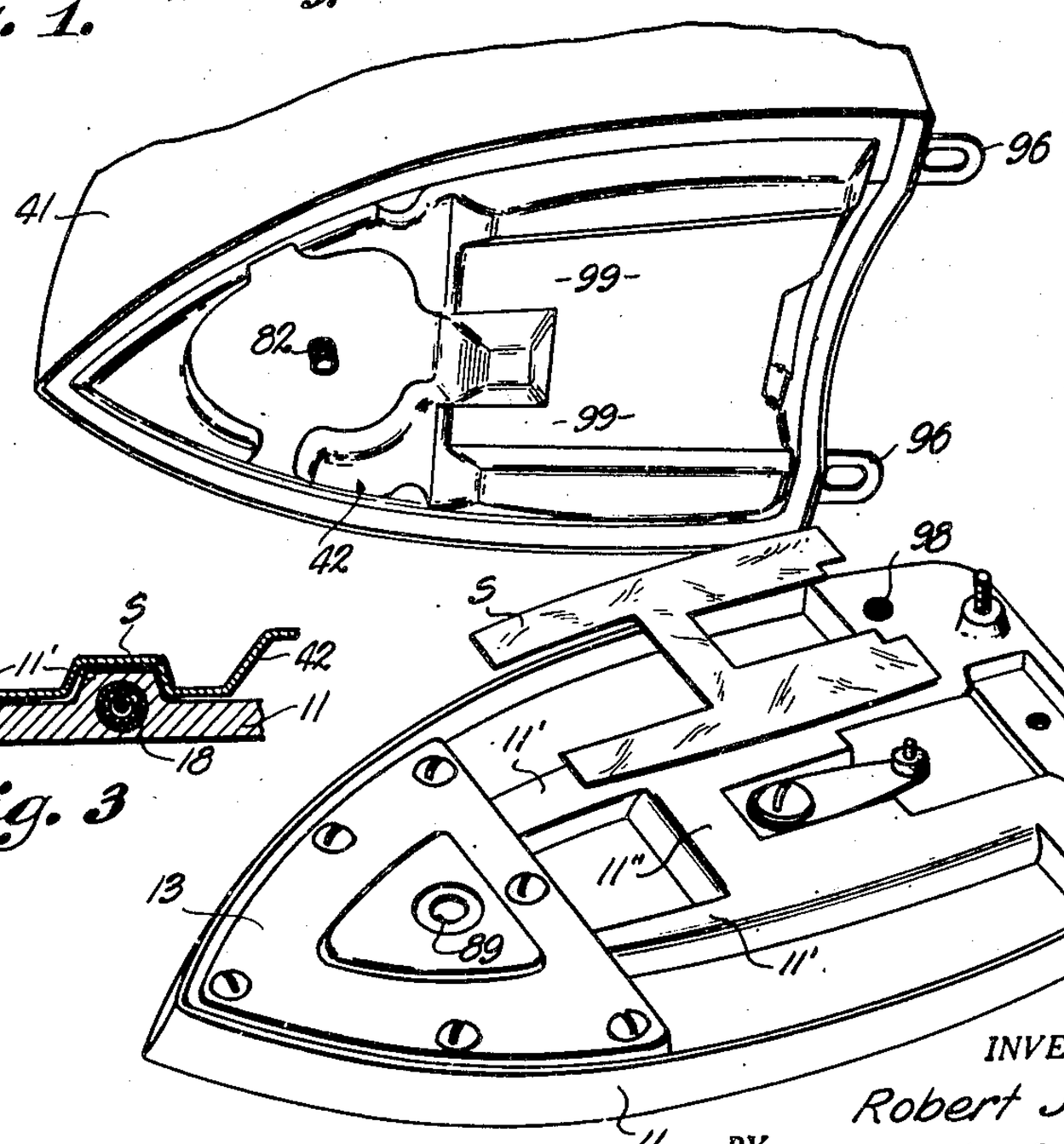

Fig. 3

Fig. 2.

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HEAT EXCHANGE APPARATUS

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4 Claims. (Cl. 38—77)

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The present invention relates in general to heat exchange and it deals more particularly with an arrangement for improving the operation of steam irons of the type disclosed in Edward P. Schreyer application, Serial No. 4,586 filed January 27, 1948, now Patent No. 2,475,572 granted July 5, 1949.

The Schreyer steam iron is one having a self-contained boiler adapted to be mounted on the sole plate so as to receive heat therefrom, and the main object of the present invention is to insure very efficient heat transfer from the sole plate to the boiler when the two are assembled together in such a unit.

More specifically, it is an object of the invention to provide an inexpensive yet reliable means for insuring efficient heat transfer between two nominally abutting surfaces despite irregularities in the surface or minor maladjustments which would result in discontinuities in their actual contact.

To this end it is a feature of the invention to interpose between the surfaces a wafer of heat conducting material of such a character that it will conform to both surfaces and fill any pockets or voids which otherwise would exist therebetween.

Another feature of the invention lies in the use of one or more layers of very soft metal foil between the surface of the heating element and the surface of the element to be heated, the two elements being clamped together in assembly so as to cause the metal of the foil to be distributed to conform with irregularities in the surfaces.

Other and further objects and features will appear in the course of the following description of the invention.

In the accompanying drawings which form a part of the specification and are to be read in conjunction therewith, and in which like reference numerals are employed to indicate like parts of the various views,

Fig. 1 is a side elevational view of an electric stream iron embodying the invention, parts being broken away for purposes of illustration,

Fig. 2 is an exploded perspective view showing the top of the sole plate, the bottom of the boiler and the heat conducting wafer interposed therebetween in the assembly, and

Fig. 3 is a fragmentary cross sectional view taken along the line 3—3 of Fig. 1.

The construction and arrangement of the iron shown in the drawings are fundamentally the same as disclosed in Schreyer Patent No. 2,475,572. In the interest of simplicity, only those

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parts of the assembly which are directly concerned with the present invention have been illustrated here, and for a fuller understanding of details that have been omitted reference may be had to the aforementioned application; to facilitate cross reference the numerals employed to identify the various parts shown in the present drawings correspond to the numerals employed for the same parts of the Schreyer application.

In general, the iron comprises a handle H mounted on a shell 41 which with its bottom 42 forms an enclosed vessel, herinafter referred to as the boiler. A funnel-like filler member 54 is provided in the top of the boiler for the purpose of introducing water therethrough, the filler opening being sealed by a closure member (not shown) when the iron is in use.

In the forward part of the boiler's bottom 42 there is a threaded nipple 82 which connects with a standpipe 85 extending into the steam space in the upper part of the boiler. When the boiler is mounted on the sole plate 11, this nipple extends through opening 89 into an enclosure 16 in the forward end of the sole plate, said enclosure being provided with outlet apertures on the under side of the sole plate through which the steam can escape into the fabric being ironed.

It will be noted that the boiler is secured to the sole plate at the rear by screws 97 extending through brackets 96 into tapped holes 98 in the sole plate; at the front of the iron the two parts are fastened together by the threaded nipple and nut 91 screwed thereon.

Steam is generated in the boiler through the application of heat to its bottom by the sole plate itself, the sole plate in turn being heated by a resistance heating element 18 embedded therein. Specifically, two serially connected legs of the heating element are located in the raised longitudinal bosses 11' on the upper side of the sole plate.

In the disclosure of the aforementioned Schreyer application these bosses and their connecting crosswise boss 11'' engage the flattened portion 99 in the bottom of the boiler. Theoretically, such an arrangement should afford excellent heat transfer from the heating element to the boiler and this would actually be true if perfect contact between the sole plate and boiler were maintained throughout the length of the longitudinal bosses 11' and the cross boss 11''.

However, it has been found impossible to consistently obtain perfect contact between the parts in commercial production. There are several reasons for this. In the first place, the sole plate

of the iron is a casting and the bottom 42 of the boiler is a sheet metal stamping which is welded about its margin to the shell 41; within the limits of usual manufacturing tolerances, when the rim of the boiler is seated on the sole plate there may or may not be perfect contact between the bosses 11' and 11'' and the bottom of the boiler. Rarely is the bottom completely out of contact with the bosses but very frequently there are discontinuities in the contact so that the two parts are engaged at some points and separated at others.

Sometimes, for example, the surface 99 instead of being perfectly flat is dished very slightly upward or downward so that it engages the bosses only at their centers or at their ends; again, on occasions it is slightly wavy or corrugated so that it engages the bosses at a series of points with gaps between those points. In those regions where there is a discontinuity of contact, it will be appreciated that the space between the boiler and the boss is very small (almost never more than one sixty-fourth inch and usually of the order of a few thousandths of an inch). Still, because the air in this small space is a very poor thermal conductor the efficiency of heat transfer is frequently reduced to approximately one-third of the value it would have if contact were made throughout the full length of the bosses.

In order to correct this difficulty, according to the present invention, a heat conducting wafer or shim is interposed between the sole plate and the bottom of the boiler. H-shaped to conform with the top of the bosses 11' and 11'' the shim is composed of one or more metal foil layers, a sufficient number of layers being used to insure that the total thickness of the shim approximates the maximum space expected to occur at any point between the sole plate and the boiler; excellent results have been obtained in most instances by employing three layers of 0.003 inch thick foil, but it will be understood that the invention contemplates the use of any number of layers.

Advantage is taken of the fact that the foil is not perfectly flat but ordinarily is somewhat irregular or wrinkled, the wrinkles in adjacent layers in a laminate shim generally being out of register with one another so that the total thickness of the shim is greater than would be the case if all layers were absolutely flat. Thus, when the iron is assembled the foil layers are flattened tightly together in those regions where the bosses and boiler are closest and in the remaining regions (where the layers may be squeezed together, but to a less extent) they afford a labyrinth of metallic heat conducting paths between the sole plate and the boiler.

Although other materials may be used, the metal preferably employed for the shims is aluminum, fully annealed in order to make it "dead soft." It is an excellent thermal conductor, stable in its properties and having a melting point well above the highest temperature involved in the operation of the iron. Moreover, when of the desired softness it is extrudable or flowable to a certain degree; that is, when clamped between

the two irregular surfaces it tends to shift away from the regions of highest pressure (or where the surfaces are nearest one another) into adjoining regions of lower pressure, and it thus conforms with the two surfaces, filling any pockets which might otherwise exist between them.

Preferably in assembly the boiler and the sole plate are clamped together in a power press while nut 91 and screws 97 are tightened down.

By use of a wafer of the character indicated the efficiency of heat transfer is frequently as much as three times as great as what it would be without the wafer. Accordingly, it will be seen that the invention is well adapted to attain all of the ends and objects hereinbefore set forth together with other advantages which are obvious and which are inherent to the structure.

Inasmuch as various embodiments of the invention may be made without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A steam iron having a steam generating boiler, a cast metal sole plate element, heating means in said sole plate element, a stamped metal element forming a portion of said boiler to be heated, a plurality of contacting layers of metal foil having high heat-conductive properties between and in contacting relationship with said elements, and means for detachably clamping said elements together with said foil therebetween so that the elements may be separated for repair purposes.

2. A steam iron having a steam generating boiler, a cast metal sole plate element, heating means in said sole plate element, a stamped metal element forming a portion of said boiler to be heated, a wafer of ductile metal foil having high heat-conductive properties between and in contacting relationship with said elements, and means for detachably clamping said elements together with said foil therebetween so that the elements may be separated for repair purposes.

3. A steam iron as in claim 1 wherein said metal foil is wrinkled.

4. A steam iron as in claim 1 wherein said metal foil is aluminum foil.

ROBERT J. SCOTT.

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