APPARATUS FOR OUTSIDE CLEANING OF BOILER TUBES

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ABSTRACT

There is provided a device for outside cleaning of boiler tubes and similar, wherein the tubes are imparted to mechanical impulses or vibration within the frequency range of 200 - 2,000 Hz, suitable at about 1,000 Hz. The mechanical impulse is directed at the tubes or a part thereof immediately connected to the tubes. Such mechanical vibration may be created with the help of a striking hammer provided with a suitable spring system to give the desired frequency or with the help of, e.g., a periodically working thyristor-guided magnetic vibrator.

5 Claims, 2 Drawing Figures
APPARATUS FOR OUTSIDE CLEANING OF BOILER TUBES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to boilers and more particularly to the outside cleaning of boiler tubes or similar. The invention provides a device for cleaning such tubes by imparting them to mechanical impulses or vibration.

2. Description of the Prior Art

Boiler tubes have usually been cleaned by striking the tube loops against each other. The limited back-and-forth movement of tube elements required for this has been obtained with the help of a working cylinder, a wabbler, or the like. One such device has been introduced in Finnish Pat. No. 44,027.

The disadvantage of such device is the excessive length of the stroke, which is also harmful when the apparatus has not been in operation and ashes have accumulated between the shock plates. In such a case the ashes cushion the shock and may even prevent the entire movement and stop the apparatus.

The method of cleaning the tubes by striking them against each other has been known for a long time. Another known method is to conduct a shock to the tubes with striking bars extending through the boiler wall. The shock creates the greatest acceleration at comparatively high frequencies, about 400 Hz. However, if the temperature of the tubes is raised, as in a boiler, the acceleration obtained at high frequencies falls sharply. This is most probably due to the fact that material yields close to the static yield point even with a short-time load effect.

The objective is the highest possible acceleration on the tube surface. A low-frequency vibration of a few tens of Hz can be easily obtained even in hot tubes. If an attempt is made to create sufficient acceleration with the help of this, the amplitude grows too much and the deformation load of the tubes surpasses the mechanical tolerance of the tubes.

The frequency of some 1,000 Hz is very practical. Sufficient acceleration values can be obtained with it without overloading the tubes, and it will not be reduced too much even in hot tubes. However, it is difficult to create this frequency, for the frequency is too high for an ordinary vibrator and cannot be obtained in hot tubes by striking them with an ordinary hammer.

The purpose of the present invention is to eliminate the above disadvantage and provide a device with which vibration of the desired frequency can be obtained.

SUMMARY OF THE INVENTION

According to the present invention there is provided a device of the character once described, which comprises means for directing a mechanical impulse, the frequency of which is 200 - 2,000 Hz, most suitably about 1,000 Hz, at the tubes or a part immediately connected with them outside the furnace of the boiler.

Such mechanical impulses may be created, e.g., with the help of a hammer provided with a spring such as a spring disk with such a stiffness that the mass of the hammer supported by it forms a vibration system with a frequency of about 1,000 Hz, an apparatus is obtained the stroke of which creates an effective impulse producing a frequency of 1,000 Hz. The created impulse is really effective, for its shape is correct (sine-shaped), and the hammer bounces back. When a hot tube is struck with a stiff hammer, the impulse is similar to that created when struck with a lead hammer.

Thus, the invention consists of an impulse-giving device producing a frequency of about 1,000 Hz (200 - 2,000 Hz). It can comprise a springed hammer, but also a periodically working thyristor-guided magnetic vibrator. It is characterized by the shortness of the impulse; this prevents the formation of resonance vibrations in the tubes and thereby prevents resonance damage. It can be applied to the block connecting the tube loops, the division block, and thereby through the ceiling to the tubes, vibration of the tube cover and also vibration of the walls.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows schematically an apparatus according to the invention in which the stroke is directed at the end of the division block situated outside the boiler, and FIG. 2 shows that end of the block connecting the tube group at which the stroke is directed.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawings, 1 refers to the ceiling of the furnace of the boiler through which tubes 2 run. The division block from which tubes 2 start is indicated by 3. The division block 3 is surrounded by an insulation 4, and the end 5 of the division block extends outside the insulation. Driving force is transmitted from a driving shaft 6, which runs through the boiler wall, by a coupler transmission 7 to a wheel 8. A plate 9 rotates with the wheel 8 in the direction shown by the arrow. A hammer 10 has been attached to the plate 9 with bearings at point 11. In the plate 9 there is also a lifting pin 12 for the hammer. When the plate rotates, the pin lifts the hammer 10, a disk spring pair 13 having been attached to its end, to the striking position from which it swings down by its own weight and strikes the end of the division block, at which time high vibrations are created the acceleration of which is sufficient to shake the scoria from the tubes in the furnace.

The high-frequency vibration is absorbed very quickly, but on the other hand it proceeds along the tube very effectively, even through the ceiling.

In FIG. 2, the block connecting the tubes is indicated by 14, and the stroke is directed at point 15 of the block.

The strokes of the hammer 10 can be most suitably arranged so that they occur at about 2 - 10 times/minute.

The invention is not limited to the solution described above and illustrated in the figures; it can be varied in many ways within the following claims.

I claim:

1. A device for outside cleaning of boiler tubes by means of tube vibration obtained with an impulse, said device comprising: a rotating plate indirectly driven by a throughgoing driving shaft, hammer means attached with bearings to said rotating plate, said hammer means having a pair of disk springs resiliently attached to the striking end thereof, and mounted in relationship to the tubes to exert a mechanical impulse thereon by striking the desired point of impulse exertion always with the
same force and at the same rate, the frequency of said impulse being in the range of 200–2,000 Hz, preferably about 1,000 Hz.

2. A device according to claim 1, wherein said hammer means is arranged to exert the mechanical impulse on a part immediately connected with the tubes outside the furnace of the boiler.

3. A device according to claim 2, wherein said part upon which the impulse is exerted is the division block of the boiler.

4. A device according to claim 2, wherein said part upon which the impulse is exerted is a connecting block constructed at the bends of the tube loops.

5. A device according to claim 1, wherein the rotating plate is provided with a lifting pin for lifting the hammer means to striking position from which it falls by its own weight and strikes said desired point.

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