

Sept. 9, 1969

K. E. VINITSKY ET AL
VIBRATING JAW CRUSHERS

3,465,976

Filed June 14, 1967

4 Sheets-Sheet 1

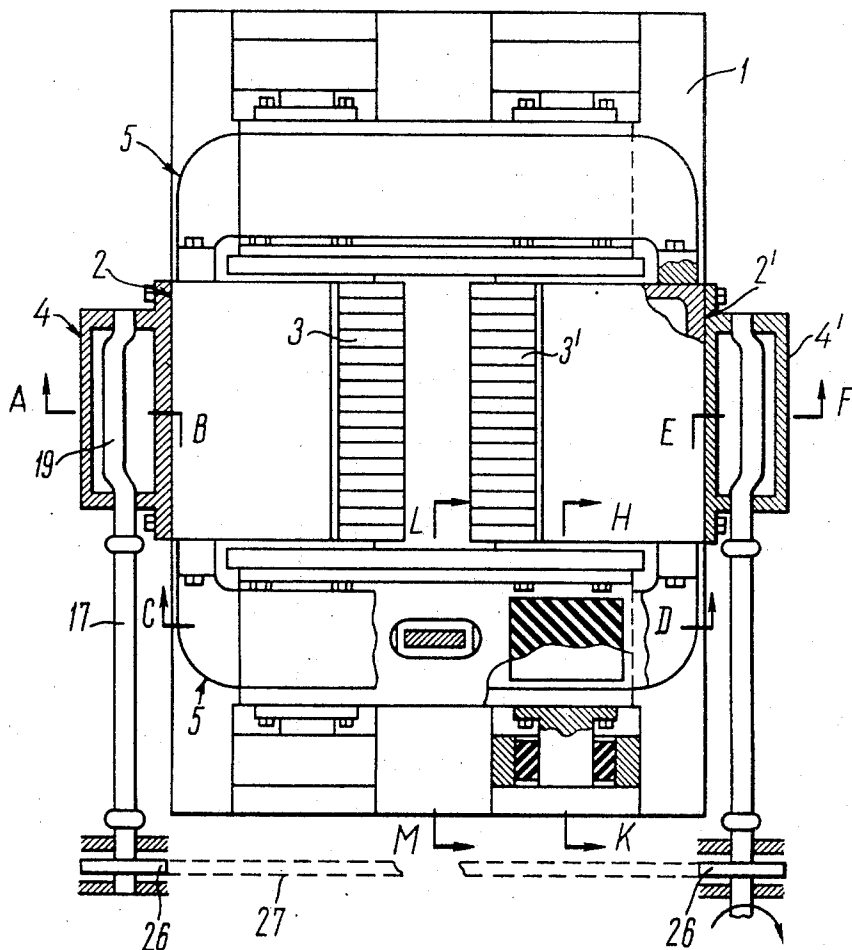


FIG. 1

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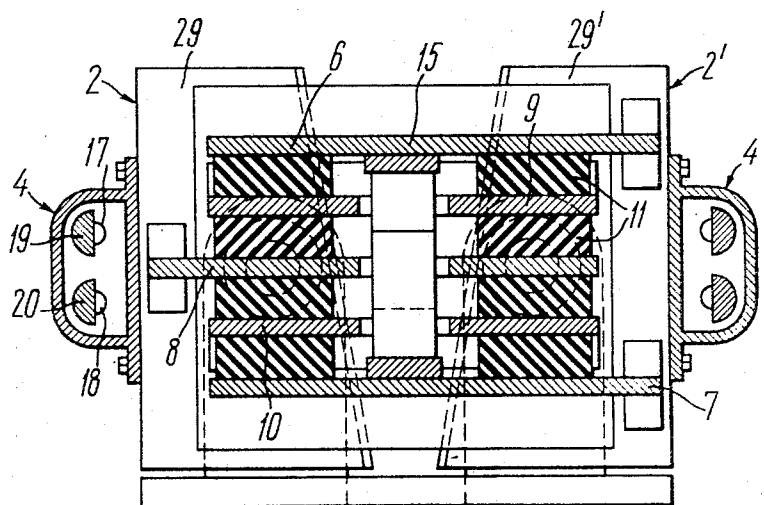


FIG. 2

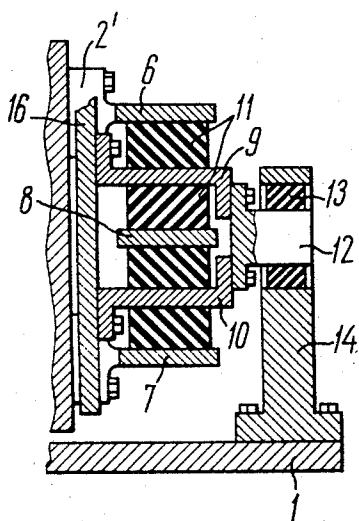


FIG. 3

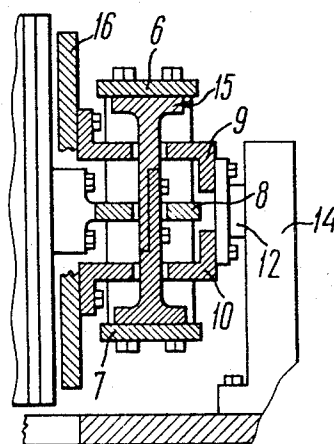


FIG. 4

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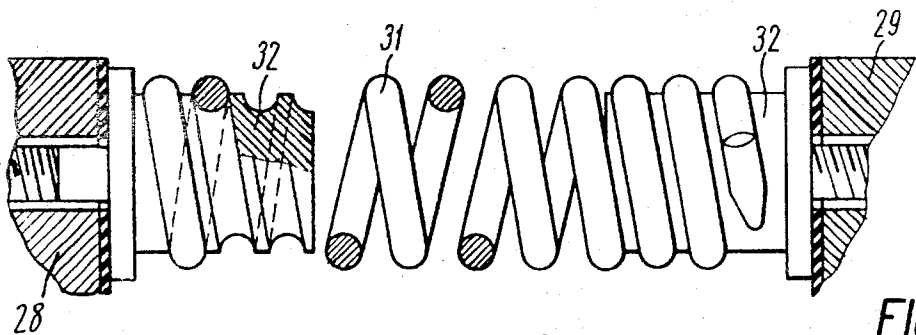


FIG. 7

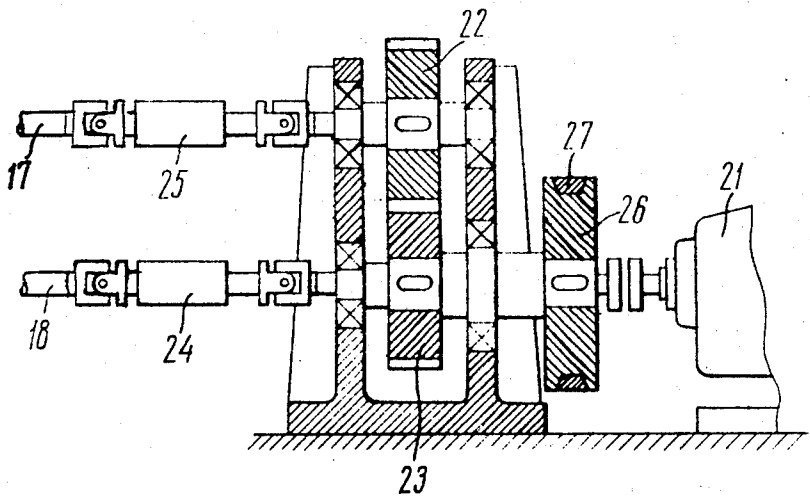


FIG. 5

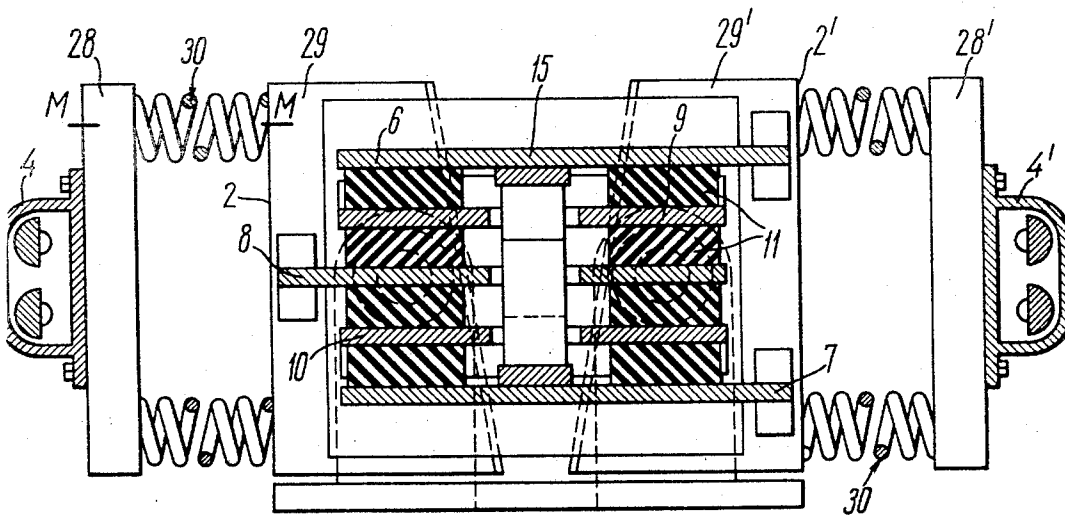
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VIBRATING JAW CRUSHERS

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4 Claims

ABSTRACT OF THE DISCLOSURE

Crusher with two vibratory jaws interconnected from the sides by shock absorbers having horizontally flat brackets with resilient elements squeezed therebetween; the upper and lower brackets are secured to the side of one jaw with a third bracket (the central one) disposed therebetween. Two other brackets are each disposed respectively between the upper and central and the central and lower brackets and are interconnected by a resilient element against the frame. Each jaw may be of two separate parts interconnected by resilient links, one part carrying a crusher plate, the other a vibrator.

The present invention relates to devices for crushing friable materials, such as stone, coal, ore and building materials, and more particularly it relates to vibrating jaw crushers.

In prior art vibrating jaw crushers crushing the materials is effected between two movable jaws performing oppositely directed horizontal vibrating motions caused by synchronously operating vibrators.

Said prior art crushers suffer from bulkiness, as well as from great weight of their supporting frames which necessitates the mounting of such crushers on foundations; the use of massive supporting frames cannot be avoided since the forces arising in the course of crushing are fully received by the frames due to hinge linkage of the crushing jaws to the supporting frames.

The above-said disadvantage prohibits the development of comparatively light weight semi-stationary and mobile designs of vibrating crushers of which modern industries, the mining one in particular, are in great need.

Another disadvantage of the known vibrating crushers is that in the latter the vibrators are fixed directly to the movable jaws which carry crushing plates and strike with these plates against the material to be crushed.

Since the linkage between the crushing plate, jaw and vibrator is a rigid one, all the loads (such as inertia, disturbing and elastic forces, impact pulses etc.) are taken up by the vibrator, the bearings of the unbalanced shafts being affected by the impact pulses more than the other elements of the vibrators, which fact results in the reduction of the service life of the bearings, thus prohibiting the development of sufficiently powerful vibrating crushers. Inertia loads may be somewhat reduced by adjusting the vibrating crusher to a near-resonance duty and by reducing the weight of the movable jaws. However, with an increase in the maximum size of lumps of the material being crushed, there occurs an inevitable increase in the weight of the movable jaws while, on the other hand, the impact pulses prevail among all other loads (when the jaws strike against the lump being crushed).

It is an object of the present invention to eliminate the above-mentioned disadvantages.

The basic object of the invention is to provide a highly efficient and powerful foundationless, mobile or semi-stationary, vibrating jaw crusher, wherein the impact pulses would not be transmitted directly to the vibrators.

Said and other objects of the present invention are ac-

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complished in a crusher of the above-described design by interconnecting the movable jaws from the sides by means of shock absorbers resting against the supporting frame of the crusher.

It is advisable that each of the shock absorbers be fashioned as a system of horizontally arranged flat brackets with resilient elements squeezed therebetween. It is feasible that two of said brackets, i.e. the lower and upper ones, be secured on the side of one of the movable jaws, while the third, i.e. the central one, disposed between the latter two, be secured on the side of the second movable jaw, two other brackets disposed one between the upper and central ones, and the other, between the central and the lower ones, being interconnected by means of a resilient element resting against the supporting frame of the crusher.

It is also advisable that each movable jaw be made up of two separate parts interconnected by means of resilient links, one part carrying a crushing plate secured thereon, and the other—a vibrator.

The resilient links of said parts of the movable jaw may be fashioned as adjustable springs secured on threaded pins whose ends are placed in seats provided in the movable jaw parts being connected.

The present invention is further exemplified by the description of possible embodiments of the vibrating jaw crusher according to the invention, reference being had to the accompanying drawings, wherein:

FIGURE 1 schematically shows an embodiment of the vibrating jaw crusher according to the present invention (plan view with a partial section);

FIGURE 2 is a section on ABCDEF of FIG. 1;

FIGURE 3 is a section on HK of FIG. 1;

FIGURE 4 is a section on LM of FIG. 1;

FIGURE 5 is a side view of the synchronizing device of the crusher shown in FIG. 1;

FIGURE 6 is a side view of another embodiment of the vibrating jaw crusher according to the present invention; and

FIGURE 7 illustrates the resilient connection of the reacting and crushing parts of the jaws of the crusher shown in FIG. 6.

The vibrating jaw crusher according to the invention, as shown in FIG. 1, has a supporting frame 1, mounted on which are two movable jaws 2 and 2' carrying on the inside respective crushing plates 3 and 3', and on the outside—vibrators 4 and 4' which impart to said jaws 2 and 2' oppositely directed horizontal vibrating motions.

The crushing jaws 2 and 2' from the sides are interconnected by means of shock absorbers 5 resting against the supporting frame 1 of the crusher.

Each of the shock absorbers 5 is essentially a system of horizontally arranged flat brackets 6 (FIG. 2), 7, 8, 9, and 10, squeezed between which are resilient rubber elements 11 operating under shear stress. The upper brackets 6 and the lower 7 are secured on the side of the right-hand movable jaw 2', while the central bracket 8 disposed between the latter two brackets is secured on the side of the left-hand jaw 2. The brackets 9 and 10 disposed between the brackets 6 and 8, 8 and 7, respectively, are interconnected by an axle 12 (FIG. 3) resting through a resilient element 13 against a brace 14 secured on the supporting frame 1 of the crusher.

In order to provide for necessary rigidity, the brackets 6 and 7 are interconnected in their middle part by means of a vertical brace 15 (FIG. 4), while the free ends of the brackets 9 and 10 are secured to a plate 16 protecting the shock absorbers 5 from being penetrated by particles of the material being crushed.

Each of the vibrators 4 and 4' (FIG. 2) has unbalance shafts 17 and 18 with unbalances 19 and 20.

Said shafts 17 and 18 are connected with an electric

motor 21 (FIG. 5) via a synchronizing device having toothed gears 22 and 23 and flexible couplings 24 and 25.

The vibrators 4 and 4' of the left-hand 2 and right-hand 2' jaws are interconnected by means of a V-belt drive having pulleys 26 (FIGS. 1 and 5) and a driving belt 27.

Shown in FIG. 6 is another embodiment of the present vibrating crusher provided with means for avoiding the transmission of the impact pulses directly to the vibrators 4 and 4'.

Each of the jaws 2 and 2' in the present crusher consists of two separate parts, viz., reactive 28 and 28', and crushing 29 and 29', respectively, interconnected by means of resilient links 30.

Secured on the inside, crushing, parts 29 and 29' of the jaws 2 and 2' are the crushing plates 3 and 3', while on the outside of reacting parts 28 and 28', the vibrators 4 and 4' are mounted.

Each resilient link 30 has a spring 31 (FIG. 7) tightly screwed from both ends onto threaded pins 32, said pins being rigidly secured in the parts of the jaws 2 and 2' which they interconnect.

In lightweight crushers the vibrating system may be adjusted to efficient resonance duties with the aid of the resilient links 30.

In larger crushers the resilient links 30 may be fashioned as rubber packing damping the impacts transmitted from the crushing plates to the vibrators.

The vibrating crusher according to the first embodiment (FIG. 1) of the present invention operates as follows.

Upon switching on the electric motor 21, the rotation of its shaft is transmitted via the synchronizing device, i.e. via the toothed gears 22, 23 and the flexible couplings 24, 25, as well as via the pulleys 26 and the driving belt 27, to the unbalanced shafts 17 and 18 of the vibrators 4 and 4'. The synchronous rotation of the shafts 17 and 18 is transmitted to the unbalances 19 and 20 which are instrumental in developing directed intermittent disturbing forces, under whose influence the movable jaws 2 and 2' start performing oppositely directed horizontal vibrating motions.

Moving simultaneously with the jaw 2 are the central brackets 8 of the shock absorbers 5 and 5', and with the jaw 2'—the upper 6 and lower 7 brackets.

Since the movements of the brackets 9 and 10 are equal in range and opposite in direction, the brackets remain at rest. Should, however, vibration of said brackets 9 and 10 occur due to inaccuracies in manufacture or some other reasons, this vibration will be damped in the resilient elements 13. Thus, the transmission of vibration to the supporting frame 1 will be reduced to a minimum.

Lumps of the material being crushed are fed by a conveyor (not shown in the drawings) into the space between the periodically separating crushing jaws 2 and 2' which, on their return movement, perform crushing of the material thanks to the impact pulses. The crushed material falls down between the separating jaws 2 and 2', wherefrom it is carried away by the conveyor.

The operation of the vibrating crusher made in accordance with the second embodiment (FIG. 6) of the present invention differs from that of the crusher described hereinabove in that the vibrators 4 and 4' mounted on the reacting parts 28 and 28' transmit the disturbing forces onto the crushing parts 29 and 29' of the jaws via the resilient links 30, thus permitting the elimination of retransmission of impact pulses onto the bearings of the vibrators 4 and 4'.

We claim:

1. A vibrating jaw crusher, comprising: a supporting frame; two movable jaws mounted on said frame one opposite the other; crushing plates secured on the inner sides of said movable jaws, between which plates a friable material is crushed; synchronously operating vibrators secured on the outer sides of said movable jaws and imparting the latter oppositely directed vibrating motions; shock absorbers interconnecting said movable jaws from the sides and resting against said supporting frame of the crusher.

2. A vibrating jaw crusher, as set forth in claim 1, wherein each of the shock absorbers is essentially a system of horizontally arranged flat brackets between which resilient elements are squeezed, two of these brackets (the upper and lower one) being secured on the side of one of the above-mentioned movable jaws, whereas the third (central) bracket disposed between the latter two is secured on the side of the second movable jaw, and two other brackets, of which one is disposed between said upper and central ones and the other—between the central and lower ones, are interconnected and, through a resilient element, rest against said supporting frame of the crusher.

3. A vibrating jaw crusher, as set forth in claim 2, wherein each of said movable jaws consists of two separate parts interconnected by means of resilient links, one part carrying said crushing plate secured thereon, and the other said vibrator.

4. A vibrating jaw crusher, as set forth in claim 3, wherein said resilient links are fashioned as adjustable springs movably secured on threaded pins whose ends are placed in seats provided in said parts of the movable jaws interconnected by said pins.

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