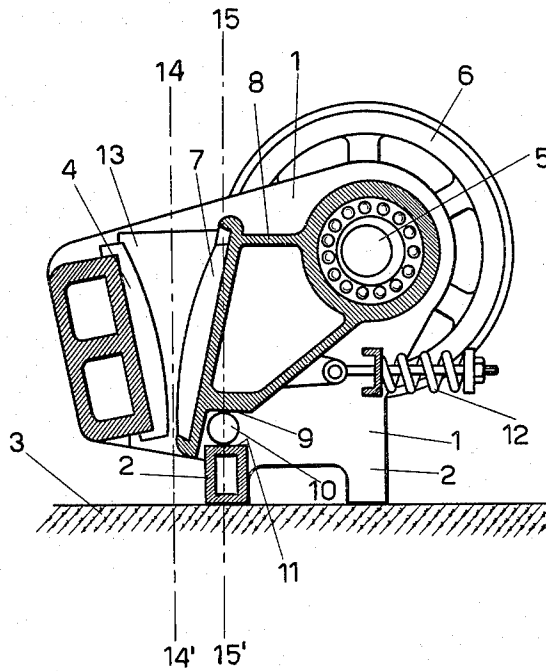


May 16, 1961

L. MUCCHI  
STONE-CRUSHING MACHINE HAVING THE ROCKING MEMBER  
DIRECTLY MOUNTED ON THE ECCENTRIC  
Filed Aug. 22, 1955

2,984,424



INVENTOR

*L. Mucchi*

BY *Clarence Downing & Seibold*

ATTORNEYS

1

2,984,424

**STONE-CRUSHING MACHINE HAVING THE  
ROCKING MEMBER DIRECTLY MOUNTED  
ON THE ECCENTRIC**

Leonardo Mucchi, Via Palestro 6, Milan, Italy

Filed Aug. 22, 1955, Ser. No. 529,779

Claims priority, application Italy Sept. 7, 1954

4 Claims. (Cl. 241-217)

This invention relates to a stone-crushing machine the rocking member of which is mounted directly on the eccentric.

It is well known to those skilled in the art that the main features of these machines are that the product must be as uniform as possible and free from splinters and dust and that the wear of the material forming the lining of the loading hole be uniform and be reduced to a minimum with respect to the produced material. It is furthermore of paramount importance that, for a given size of the loading and of the discharge holes the output be the maximum obtainable.

The stone crushing machines having the rocking member directly mounted on the eccentric, of the types hitherto adopted, for the production of rubble and for the production of broken stones as well, are very much inadequate in this respect.

These prior art machines generally have a jaw fixed or adjustably mounted on the framing of the machine, and a movable jaw borne by a rocking member driven to a rocking motion by a shaft bearing the eccentric and a toggle interposed between a point of the framing of the machine and the rocking member. Said toggle, in the known types, is always located in a plane lying in the neighborhood of the plane containing the line of contact of the rocking member and of the toggle and normal to the plane containing the axis of the eccentric shaft and the aforesaid line of contact.

In any case in these known machines the plane of the toggle forms a sufficiently wide angle to the middle plane of the loading hole.

Due to said arrangement of the toggle, in the hitherto known machines the following phenomena occur, in variable but always considerable and consequently harmful extent.

The movable jaw has in every point a motion having many components parallel to the middle plane of the feed hopper. This causes the stones to be crushed to be subjected to noticeably high shearing stresses which are the prominent cause of the formation of splinters.

Furthermore an unduly large friction exists between the stone being crushed and the lining of the feed hopper and consequently a considerable wear of said lining occurs with a resulting great production of dust.

Said components of the motion parallel to the middle plane of the feed hopper vary, moreover, from one point to another of the movable jaw in the sense of the height of said jaw, so that an irregular wear occurs in the various points of the jaws, which sometimes are found to be completely out of commission in certain spots while they are in perfect conditions in other spots.

A further disadvantage of said machines hitherto known exists in that the motion of the movable jaw does not show a gradual increase proceeding from top to bottom, in the stroke normal to the middle plane of the feed hopper, this increase being desirable in order to compensate the reduction, from bottom to top, of the horizontal cross-section of the feed hopper itself.

2

The motion of the movable jaw results, instead, in many instances, ampler in correspondence to the feed hopper than it is in correspondence to the discharge opening, and this causes a considerable "chocking" which adversely affects the rate of output and the wear of the jaws.

A primary purpose of the present invention is to overcome the above mentioned disadvantages shown by the stone crushing machines of the types hitherto known.

The intended purpose is attained by providing a stone crushing machine of the jaw type, and having a simple toggle, in which both the bearing surface of the toggle and the bearing surface of the rocking member which bears the toggle are arranged on the machine frame, substantially perpendicular to the middle plane of the feed hopper and by extending the latter substantially below the plane containing the axis of the shaft of the eccentric and parallel to said bearing surface of the toggle on the framing.

Preferably the feed hopper is substantially extended between said plane containing the axis of the shaft carrying the eccentric and parallel to the bearing surface of the toggle on the framing, and said bearing surface.

This and other features of the stone crushing machine according to the present invention will become fuller and more apparent from the following description, reference being made to the sole accompanying drawing which shows, by way of example and not limitation, a possible embodiment of the machine in lengthwise sectional view.

For the purpose of clarifying the novel features of the present invention only the essential parts of the machine have been shown in the drawing, overlooking all those parts, such for example as the fixing devices of the jaws, the systems for adjusting the discharge opening, etc., not strictly necessary to a clear understanding of the invention and not substantially different from the ones adopted in the machines hitherto known.

The stone crushing machine according to the invention is provided with a main frame 1, resting on the floor 3, to which it is conveniently affixed by means of the feet 2. Frame 1 bears the fixed jaw 4 and also supports the eccentric shaft 5 on which the flywheel 6 is attached.

The eccentric shaft 5 is actuated so as to effect a rotary motion, by suitable driving means which are well known in the art and are not shown in the drawing.

The movable jaw 7 is affixed to a rocking member 8 attached to the eccentric shaft 5 at its upper end and its lower surface 9 resting upon a roller 10 which, in turn, rests on the plane 11 of which the frame 1 is provided. A helical spring 12 which operates between a part solid with the frame 1 and a part articulated to the rocking member 8 acts in such a way as said rocking member, during its movement derived from the rotation of the eccentric shaft 5, is always resting over roller 10.

The fixed jaw 4, with the movable jaw 7 form the feed hopper 13, and the trace of the middle plane of said hopper over the plane of the drawing is indicated by the dash-dot line 14-14'. The dash-dot line 15-15' indicates the trace, over the plane of the drawing, of the plane in which the end reaction between plane 11 and roller 10 is contained.

It is to be noted that the bearing plane 11 provided on the frame 1 is substantially perpendicular to the middle plane 14-14' of the feed hopper 13. The same condition exists for the lower bearing plane 9 of the rocking member 8. By this arrangement the direction of the motion of any point of the movable jaw 7 is substantially perpendicular to the middle plane 14-14' of the feed hopper, due to the fact that there are substantially no components parallel to said plane, wherefrom the advantage arises of nearly completely overcoming the disadvantage of the formation of splinters or dust.

It will be apparent to those skilled in the art that the motion of any point rigidly connected to the rocking member 8, follows a nearly flat oval track the major axis of which is substantially parallel to the plane 11 and the minor axis of which decreases the more the point considered is near the plane 15—15'. For the points lying over that plane 15—15' the minor axis of said track is practically nil.

As the surface of the movable jaw extends in a restricted area in the neighborhood of plane 15—15' parallel to the middle plane 14—14' of the feed hopper 13 and containing the line of contact of the roller with its bearing surface, all the points of the movable jaw travel over tracks the minor axis of which are very small.

The major axis of the oval track has a minimum length for the points lying over the plane containing the axis of the eccentric shaft 5 and parallel to the supporting plane 11 and increases proportionally to the distance from said plane for the points which are outside said plane.

As the feed hopper is essentially extended between the plane containing the axis of the eccentric shaft 5 and parallel to the bearing surface 11 of roller 10 on the frame 1, the motion of the movable jaw is, therefore, much larger towards the bottom (near the discharge opening) than it is towards the top (near the feed hopper). By this novel arrangement the harmful chocking effect of the heretofore described prior art devices is suitably overcome.

A further advantage of the machine according to the invention exists in that the supporting plane 11 is substantially horizontal and this is in perfect agreement with the fact that the best arrangement of the feed hopper 13 is apparently with the middle plane 14—14' vertical. This feature permits to reduce the toggle to its simplest form of a roller of minimum diameter. From this arrangement the possibility also exists of being able to approach by the maximum extent, consistent with the constructional requirements of the machine, the plane 15—15' to the middle plane 14—14' and so to reduce considerably the bulk of the machine with a consequent reduction in its weight. An additional advantage exists, due to the small inertia of the roller, whereby the roller 10 actually rolls over the bearing surfaces and thus the absence of wear of the roller and of its seat is ensured.

It is not possible to reduce the toggle to a simple roller in the machines hitherto known because all of these machines have the bearing plane of the toggle very much inclined, and this fact would hinder the regular operation of a roller toggle.

Roller 10 is suitably guided by a cage (not shown in the drawing) having two parallel faces acting on the two end faces of said roller. Said guide does not introduce any additional resistance to the oscillatory motion of the roller

but merely prevents it from accidentally going out of register.

It is to be further noted that the construction above described enables the vertical dimensions of the machine to be very much reduced and to have the feed hopper and the discharge opening free from any obstruction both frontally and laterally.

What I claim is:

1. A stone crushing machine comprising a supporting frame, a fixed jaw member affixed to said supporting frame, a moving jaw member movably disposed upon said supporting frame, a horizontally disposed toggle on said frame substantially in the plane of the lower end of said fixed jaw member to guide said movable jaw for horizontal movement at its lower end, an eccentric rotating shaft mounted on said frame for imparting reciprocating movement to said moving jaw member relative to said fixed jaw member, said fixed and moving jaw members forming a vertical feed hopper for the stone to be crushed, said feed hopper lying substantially entirely below the horizontal plane of the axis of said eccentric shaft thereby ensuring a substantially horizontal reciprocating movement of said moving jaw relative to said fixed jaw.

2. In a stone crushing machine of the jaw type having a stationary jaw and a movable jaw, the space between the two jaws defining a substantially vertical downwardly tapering feed hopper, a rotatable eccentric shaft lying in a horizontal plane substantially at the top end of said feed hopper, an eccentric on said eccentric shaft, a bearing in said movable jaw operatively engaging said eccentric, a toggle extending in a horizontal plane adjacent the lower end of said movable jaw, and means on said movable jaw to engage said toggle for horizontal movement thereon.

3. A stone crushing machine according to claim 2 characterized in that the toggle is a roller.

4. A stone crushing machine according to claim 3 characterized in that the surface of the movable jaw is extended in a restricted area of the plane parallel to the middle plane of the feed hopper and containing the line along which the toggle or roller contacts its bearing surface.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

76,100	Reese	Mar. 31, 1868
197,643	Lanyon	Nov. 27, 1877
203,054	Lipsev	Apr. 30, 1878
357,568	Brennan	Feb. 15, 1887
863,833	Bunnell	Aug. 20, 1907
966,651	Cochran	Aug. 9, 1910
2,257,166	Fisher	Sept. 30, 1941