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MAY 25, 1943.
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J. EIRICH
MIXING MACHINE
Filed July 3, 1940

Serial No.
343,887
2 Sheets-Sheet 1

Fig. 1

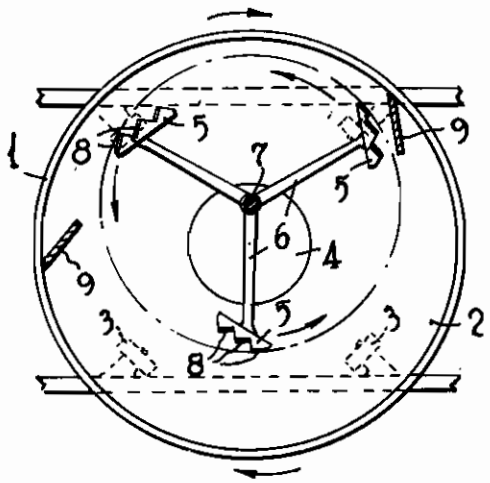

Fig. 3

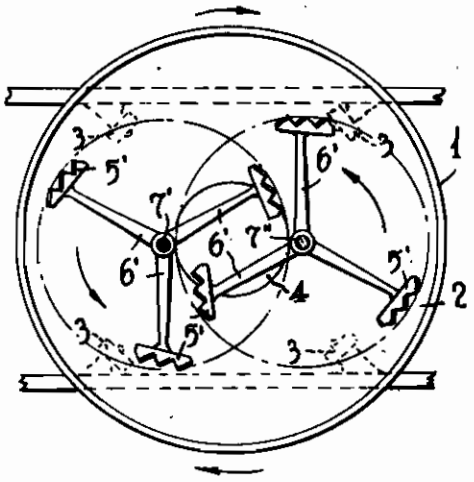

Fig. 2

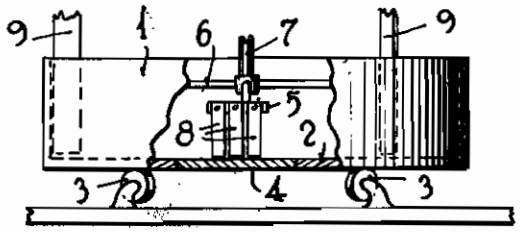

Fig. 8

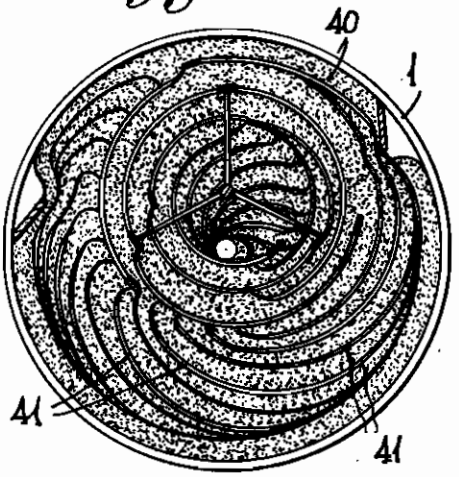

Fig. 6

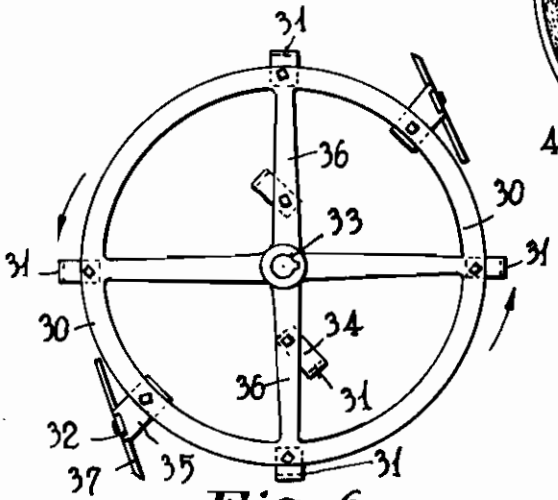

Fig. 7

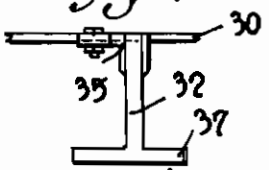

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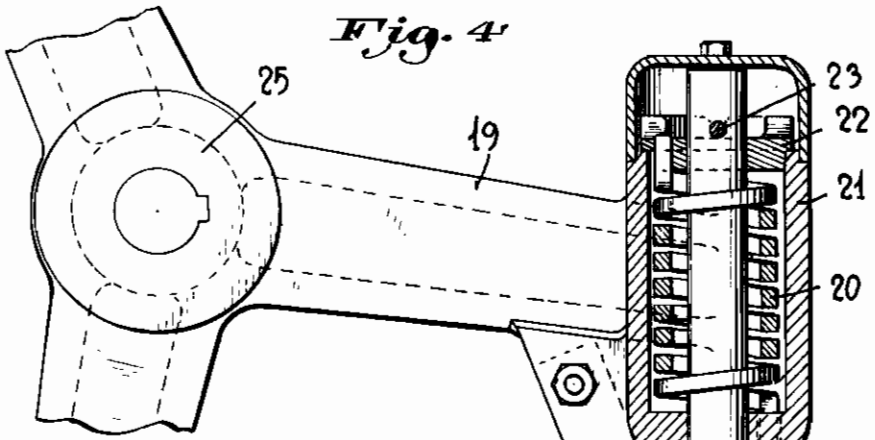
Fig. 4



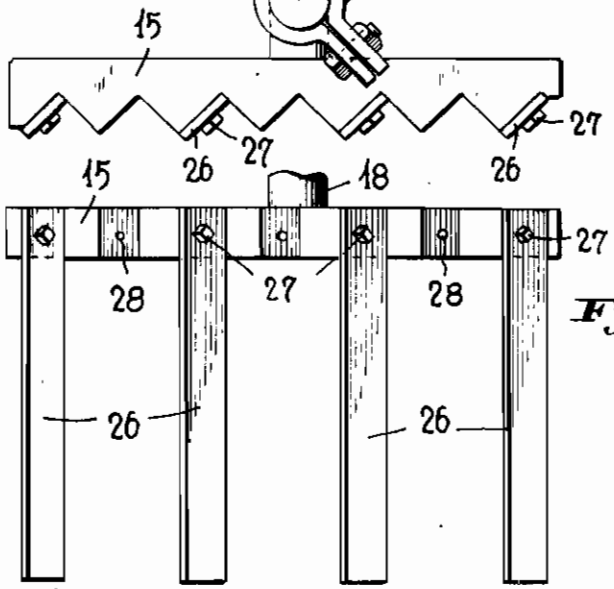


Fig. 5

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ALIEN PROPERTY CUSTODIAN

MIXING MACHINE

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vested in the Alien Property Custodian

Application filed July 3, 1940

The present invention relates to improvements in mixing apparatus for mixing viscous or plastic substances or materials becoming viscous or plastic during the mixing operation.

Hereinafter in the specification and claims the term "plastic substances" will be employed to cover viscous or plastic substances or materials becoming viscous or plastic during the mixing operation.

The present application is a continuation-in-part application of application S. N. 213,906, filed June 15, 1938, which is a continuation-in-part of application S. N. 35,394, filed August 8, 1935.

It is an object of the present invention to provide an apparatus which will thoroughly mix plastic substances with a minimum expenditure of energy in as short a time as possible.

Other objects of the present invention will become apparent from the following specification and claims:

The preparation of mixtures from plastic substances is very difficult because the high cohesion of such substances impedes the admixture of other materials. Previously, it was found necessary to employ apparatus essentially having a kneading action in order to effect mixtures of plastic substances. This type of apparatus possesses the disadvantages that it is difficult to control and that it requires relatively high power requirements.

It has now been unexpectedly found that even tenacious plastic substances can easily and rapidly be mixed to produce homogeneous mixtures with the aid of rapidly rotating knife-like rods which are arranged to produce a rake-like action upon the material to be mixed with only a relatively low power requirement. These rotating rods are arranged so that they substantially come in contact with the surface supporting the material to be mixed, such as the horizontal surface of a mixing bowl, and so that they describe a planetary movement with respect to such surface. The rods thereby describe paths which repeatedly cross over each other and effectively cut the material into narrow strips or bands in constantly varying directions.

In accordance with the present invention the mixing apparatus comprises a mixing bowl having a substantially flat, circular, horizontal mixing plate, and a plurality of rods adapted and arranged to have a knife-like action, which rods rotate about a vertical axis eccentric to the mixing plate and are spaced at varying distances from such eccentric axis so as to provide a rake-like action. The mixing apparatus is furthermore adapted and arranged so that the rods rotating about the eccentric axis possess a counter-current planetary movement with respect to the mixing plate, which movement may, for example, be effected either by rotating the mixing plate in a direction opposite to the rotation of the rods about the eccentric axis or by holding the mixing plate stationary and rotating the eccentric axis about the center of the mixing plate in the same direction as the rotation of the rods about the eccentric axis.

The knife-like rods must be so arranged that upon rotation about the eccentric axis they cut through the material to be mixed with the narrow edge leading.

Furthermore, the rake-like element or elements composed of such rods preferably are so arranged that such element or elements when rotating about its respective eccentric axis describes a circular path with respect to the eccentric axis, the diameter of which is greater than one-half of the diameter of the mixing plate. For example, when the mixing apparatus contains rods rotating about only one eccentric axis the resulting rake-like action must include a circular path, the diameter of which is greater than one-half the diameter of the mixing plate.

It is also possible, of course, to provide an apparatus producing the same action wherein the rotating rods revolve about several axes eccentric to the center of the mixing plate. In such instanee, the sum of the diameters of the circular paths described by the rake-like elements when rotating about their respective eccentric axes should be greater than the diameter of the mixing plate. When the apparatus contains rods arranged to produce a rake-like action which rotate about two eccentric axes, the rake-like action obtained by the rods rotating about each eccentric axis preferably includes a circular path somewhat more than one-half of the diameter of the mixing plate, and the eccentric axes are preferably diametrically opposite to each other with respect to the center of the mixing plate and are synchronized so that the rods do not interfere with each other.

When the paths of the rake-like element or elements are of the above-described magnitude, a mixing action is obtained which does not merely affect the plastic material at one specific spot on the mixing plate as the paths of the individual knife-like rods which produce the raking action constantly cross over each other and cause the material being mixed to be drawn from one side of the mixing plate to the other.

The apparatus in accordance with the present invention is exceptionally suitable for preparing homogeneous mixtures from varied types of plastic substances. For example, plastic clays or similar materials which may contain an addition of coloring matter, resins and artificial resins, fertilizers, molten masses, raw refractory masses, bituminous masses and the like may

be easily mixed in apparatus in accordance with the present invention. The apparatus is also especially well suited for obtaining mixtures from plastic substances and requires relatively little power and only a short mixing period. One or several of the materials to be mixed may be plastic or the mass to be mixed may become plastic during the mixing operation, as is the case when pulverulent substances are mixed in the presence of liquids, such as waterglass, cementing agents, or when molten liquid masses solidify during the operation.

The individual knives or cutting rods producing the rake-like action can be arranged upon holders with greater or smaller distances between them, depending upon the type of material to be mixed. It is essential in each case, however, that such knives or cutting rods are arranged so that the material to be mixed is repeatedly subdivided into narrow strips in varying directions.

In the drawings accompanying and forming a part of the specification several specific embodiments of the apparatus in accordance with the invention are shown by way of example.

In the drawings:

Fig. 1 diagrammatically shows a top view of a mixing machine provided with rake-like elements rotating about one eccentric axis;

Fig. 2 diagrammatically shows a side elevation partly broken away and partly in section of the mixing machine shown in Fig. 1;

Fig. 3 diagrammatically shows a top view of a mixing machine provided with rake-like elements rotating about two eccentric axes;

Fig. 4 shows a plan view partly in section of a rake-like element and resilient supporting arm;

Fig. 5 shows a rake-like element in elevation;

Fig. 6 shows an enlarged plan view of a circular element provided with mixing tools arranged to produce a rake-like action upon rotation of the circular element;

Fig. 7 shows in elevation one of the mixing tools employed in conjunction with the circular element shown in Fig. 6; and

Fig. 8 diagrammatically shows the mixing action obtained with the apparatus shown in Fig. 1 or 6.

In Figs. 1 and 2 the mixing bowl 1 having the mixing plate 2 mounted on positively driven rollers 3 rotates in the direction of the arrow. Plate 4 closes the discharge opening during the mixing operation. The rake-like elements 5 are supported by arms 6 which are attached to the rotary shaft 7 which is arranged eccentrically to the center of the mixing bowl. The rotary shaft 7 rotates in a direction opposite to the direction of the rotation of the mixing bowl. The arms 6 are of such length that the circular raking action produced by the rake-like elements is of a diameter greater than one-half the diameter of the mixing bowl. The knife-like rods 8 of the rake-like elements 5 extend down substantially to the mixing plate 2 and are so arranged that they slice through the material to be mixed cutting such material into a plurality of narrow strips. The stationary scrapers 9 are provided to remove any of the material to be mixed which may stick to the side walls of the mixing bowl.

In Fig. 3 the mixing bowl 1 is provided with rake-like elements 5' which rotate about two shafts 7' and 7'', each of which is arranged eccentrically with respect to the mixing bowl. The rotation of the rake-like elements is opposite to the direction of rotation of the mixing bowl, as in the modification shown in Figs. 1 and 2. The rake-like elements are supported by arms 6' which are connected with the rotating, eccentric shafts 7' and 7'', and each of such elements contains the knife-like rods 8 which extend downwardly substantially to the mixing plate 2 of the mixing bowl and the raking diameter of which is greater than one-half the diameter of the mixing-bowl.

In Fig. 4 the rake-like element composed of the serrated holder 15 and the knife-like rods 26 is supported by arm 16 to which it is clamped by the screw clamp 17 which rigidly holds the rod 18 extending upwardly from the serrated holder. Arm 16 is resiliently connected with arm 19. This resilient connection is effected by the coil spring 20 which is in the housing 21 rigidly connected with arm 19. One end of the coil spring engages with such housing and the other end engages with the collar 22 which is around arm 16 and engaged therewith by pin 23. The spring is tensioned to urge the arm 16 to rotate counter-clockwise. The arm 16 rests upon flange 24 which is supported by arm 19 and is thereby held in normal operating position. This resilient mounting of the rake-like element, however, permits such element to swing upwardly in the event that it meets with an obstruction during a mixing operation.

Arm 19 is rigidly attached to the collar 25 for engagement with a rotating shaft arranged eccentrically to a mixing plate, such as shown in Figs. 1 through 3.

The knife-like rods 26 of the rake-like element are held in place by bolts 27 in the serrations of the holder 15. The holder 15 contains a sufficient number of serrations so that the spacing between the knife-like rods may be varied by adding to the number of the knife-like rods attached to the holder or by removing some of them.

In Fig. 5 a plan view is given of the rake-like element shown in Fig. 4. The holes 28 are to receive the bolts of further knife-like elements which may be attached to the holder if desired.

In Fig. 6 a circular element 30 is shown for supporting knife-like rods 31 and 32. The circular element 30 is provided with an aperture 33 for engagement with a rotating shaft arranged eccentrically to a mixing plate as shown in Figs. 1 through 3. The knife-like rods 31 and 32 are respectively attached to the circular element by clips 34 and 35 and extend downwardly from the circular element. Two of the knife-like elements 31 are attached to cross arms 36 of the circular element so that upon rotation of such element about the aperture 33 a rake-like action is obtained. It is, of course, possible to attach more knife-like rods to the cross arms of the circular element if a more intense raking action is sought.

The lower extremities of knife-like elements 32 are provided with horizontal bars 37, as may be clearly seen from the side elevation thereof in Fig. 7, which serve to loosen material from the mixing surface.

Fig. 8 shows diagrammatically the action of the apparatus shown in Figs. 1 and 2 upon plastic material 40. Paths 41 represent the paths of the knife-like rod 8 of the eccentrically rotating rake-like elements 5, and it may be seen herefrom how the intensive mixing action in accordance with the present invention is obtained.

JOSEPH EIRICH.