Aug. 1, 1939. F. J. STOKES 2,168,075

COMPRESSING MACHINE

Filed Oct. 14, 1935 2 Sheets-Sheet 1

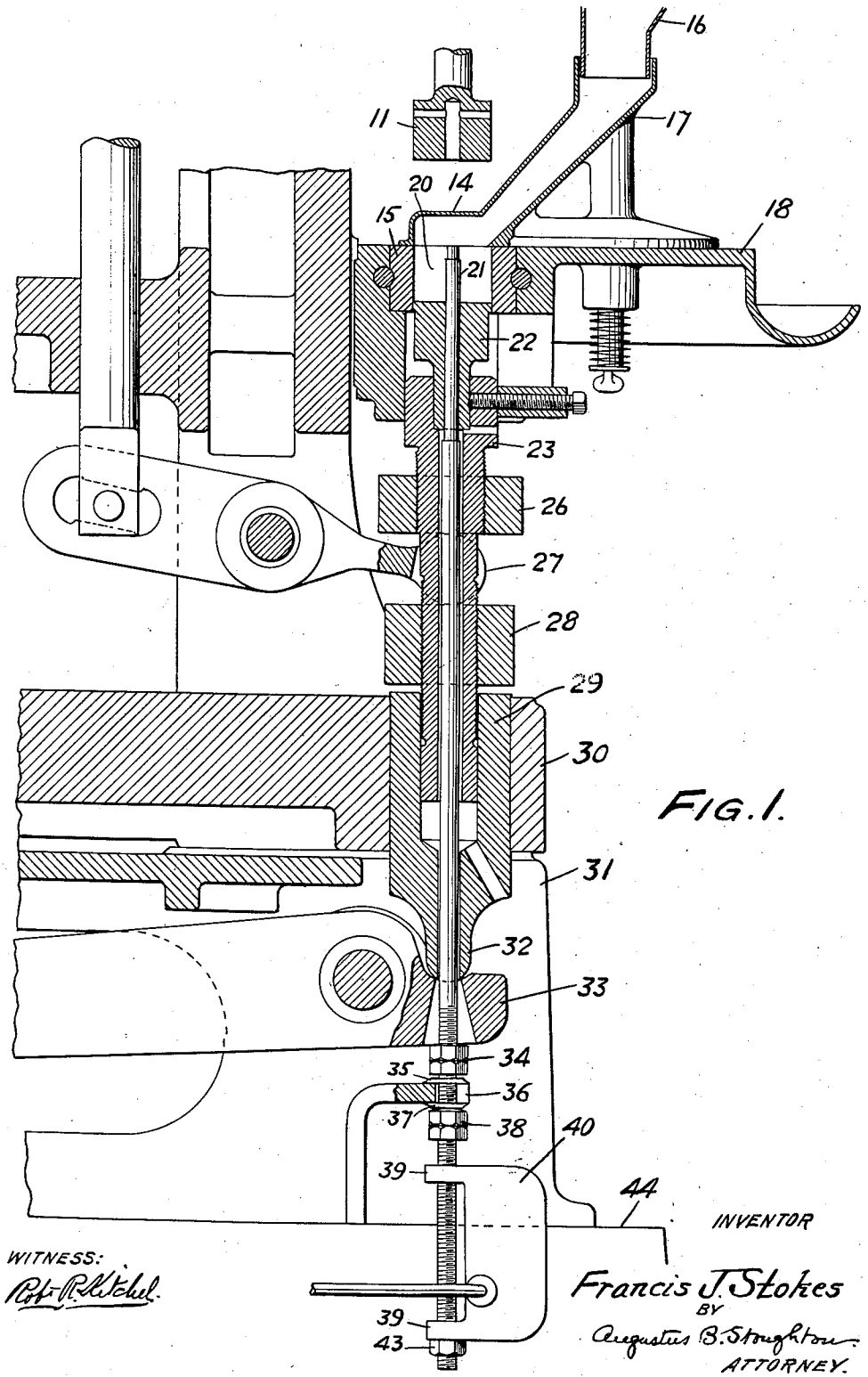


FIG. 1.

WITNESS:

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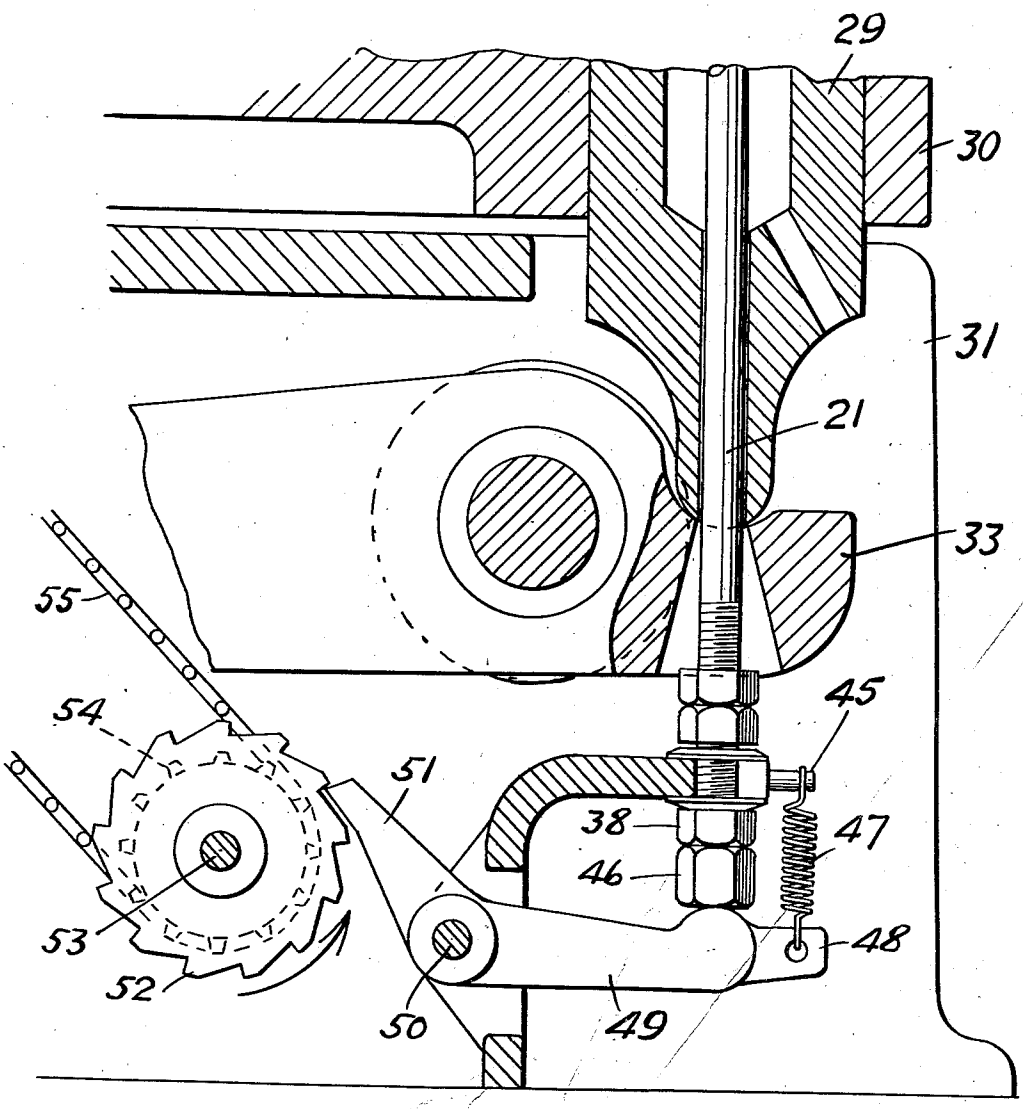


FIG. 2.

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UNITED STATES PATENT OFFICE

2,168,075

COMPRESSING MACHINE

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Application October 14, 1935, Serial No. 44,906

4 Claims. (Cl. 18—5)

This invention pertains to improvements in tablet-compressing machines and particularly to machines used in the manufacture of perforated tablets from pulverulent, granular or plastic material such as sugars, ceramics, Bakelite, etc.

When producing tablets from materials containing reinforcing fillers, such as asbestos fibres, etc., it is impossible to obtain the uniform fill required for the production of tablets having equal density throughout the run. This is particularly true when the mold-cell is partly obstructed by a hole-forming punch, hereafter referred to as the core-rod. Through my invention this handicap has been eliminated and the obstructing core-rod is made use of as the means for producing the needed agitation settling the material uniformly in the mold-cell.

The difficulties recited above with fibrous materials are also present when attempting to manufacture tablets from pulverulent or finely divided powders. Such material not only produces tablets of varying density but capping also prevents the successful use of these types of machines in tablet manufacture. By the term "capping" is to be understood the cracking or splitting of the tablet as it is being ejected after compression, caused by the re-expansion of the air trapped within the tablet. The agitation produced by vibration helps the air to escape and thus uniform fills are obtained and capping eliminated.

In general, the invention is embodied in a machine having a fixed frame and base with arrangement for the reciprocation of a pair of opposed punches; a table fastened to the frame and provided with a recess and seat for the die and an aperture aligned with this recess, there being a corresponding aperture in the frame through which the lower punch reciprocates; an automatic material feeding device synchronized with the movement of the punches; and a core-rod supported on the base and extending up through the hollow center of the lower punch. The machine also embodies all the usual mechanisms incident to the efficient operation and control of a tablet compressor.

In the following description, reference will be made to the accompanying drawings forming part hereof and in which:

Fig. 1 is an elevational view, partly in vertical cross-section.

Fig. 2 is a detail view, with parts in vertical cross-section, of a modification.

Referring to the drawings, **30** indicates so much of the fixed frame as is necessary to show the association of parts in a preferred construction embodying my invention. The frame **30** may be fastened to a fixed base **31**, which rests on a suitable foundation **44**. Table **18** is fixed to the frame **30** and mounted in this is the die or mold **15**. On top of table **18** and oscillating over die **15** is the usual feed shoe **17**, which conveys the material to be compressed from the feed hopper **16** to the mold-cell **20**. There is an upper punch **11** mounted in the usual reciprocating punch holder (not shown). A corresponding lower punch **22** is mounted in punch holder **23**, which is slidably guided at the punch end by an aperture in table **18** aligned with the die **15**, and at the other end movably arranged in a sleeve **29** movable through an aperture in frame **30**. The function of sleeve **29**, its yieldable support **33**, as well as the means (elements **26**, **27** and **28**) for adjusting the position of punch holder **23** with respect to the desired charge of material to be compressed, is described in U. S. Letters Patent No. 1,786,637, granted to me on December 30, 1930.

A core-rod **21**, usually rigidly fixed to base **31** at **36**, extends slidably through the hollow punch holder **23** and punch **22** a suitable distance into mold-cell **20** of die **15**. It is evident that core-rod **21** forms a considerable obstruction in the mold-cell **20** when the charge is delivered, particularly if the material is stringy or fibrous. Such a material has a tendency to hang up or bridge as it drops into the cell, causing voids in the charge with the result of varying densities in the tablets compressed. When attempting to compress pulverulent materials, the air in the mold-cell is trapped under the charge and mixed or dispersed in the fine powder being compressed within the tablet as this is being made and as the pressure from the punches is removed this compressed air expands, causing the tablet to flake or crack.

Heretofore, the difficulty referred to above prevented the use of standard compressors in the manufacture of tablets from fibrous material or from fine powders.

To overcome this difficulty, I vibrate the core-rod and have found that this produces a very effective agitation and settling of the charge resulting in uniform fills and thus tablets of uniform density are obtained.

The vibration may be produced by any suitable means such as, for example, by means of an auxiliary vibrator suitably fixed onto the core-rod. While the oscillating feed shoe **14** may be subjected to vibration in addition to its oscillating motion and, while this vibration is help-

ful, it is not sufficiently effective on the material in the mold-cell to overcome the difficulties recited. A preferred method of construction is shown in the drawings, in which **40** represents a vibrator-body, such as an electric vibrator, fixed to the core-rod **21** in any suitable manner, for example, by means of brackets **39** with holes threaded to fit on the end of the core-rod. The vibrator may be locked securely in place by means of lock-nut **43**.

Another type of vibrator which may be used consists merely of a hammer placed in a suitable position to pound on the core-rod, or on an anvil fixed to the core-rod, so as to impart vibrations to the core-rod.

Yet another type of vibrator susceptible of use is an eccentric or cam suitably mounted so that a lever actuated by the eccentric or cam would cause the core-rod to vibrate or oscillate. The frequency of vibration depends upon the outline of the cam surface as well as the speed of the cam.

As mentioned above, the core-rod is usually rigidly fixed to some support, like **36** on the base **31**, but when using a vibrator it may be of advantage to give the core-rod some freedom so as to make it sensitive enough to reproduce the vibrations imparted to it. This freedom or end-play of the core-rod may be obtained by some such arrangement of parts as shown where the core-rod is held in position by lock-nuts **34** and **38**. This may be adjusted to support core-rod **21** at any desired height with relation to the face of die **15** and at the same time may be locked in place so as to give a suitable freedom or end-play to the core-rod. Should a resilient action be preferred, cushions or pads **35** and/or **37** of suitable shape and material can be provided.

One of the lock-nuts **38** has been made slightly longer than in the modification shown in Fig. 1 so as to act as an anvil **46**. Against this anvil strikes the hammer **49** which is part of a lever fulcrumed at **50** and having one arm **51** actuated by a ratchet or toothed wheel **52**. The lever is pressed against the teeth of the wheel **52** by means of a spring **47** extending between an extension **48** of arm **49** and a pin **45** fastened to the base of the press. The toothed wheel **52** is fastened on the shaft **53** with bearings in the base of the press, and having at one side a pulley **54** driven through a belt **55** from one of the cam shafts (not shown) of the machine. The proportions are such that, when the end of lever **51** drops off the top of a tooth, it imparts a blow on the anvil **46**, there being sufficient clearance so that the lever end **51** will not touch the wheel at that point. The frequency of vibration depends, of course, entirely on the speed at which the toothed wheel **52** is operated. This speed, of course, is adjustable by the ordinary means of changing the drive.

It is to be understood that my invention is not to be limited save as the scope of the prior art and of the attached claims may require.

I claim:

1. In a tablet-compressing machine having a pair of co-operating punches mounted for movement towards and away from each other and having a mold located to receive the operating ends of said punches therein, a fixed part of said machine, a core-rod projecting through said fixed part and into said mold, lock-nuts adjustably securing said core-rod in said fixed part, and a vibrator rigidly secured to said core-rod for oscillating said core-rod to fill said mold uniformly and to produce tablets of uniform density.

2. In a tablet-compressing machine having a pair of co-operating punches mounted for movement towards and away from each other and having a mold located to receive the operating ends of said punches therein, a fixed part of said machine, a core-rod projecting through said fixed part and into said mold, cushions of resilient material interposed between said core-rod and said fixed part, lock-nuts bearing on said cushions and adjustably securing sair core-rod in said fixed part, and a vibrator rigidly secured to said core-rod for oscillating said core-rod to fill said mold uniformly and to produce tablets of uniform density.

3. In a tablet-compressing machine having a pair of co-operating punches mounted for movement towards and away from each other and having a mold located to receive the operating ends of said punches therein, a fixed part of said machine, a core-rod projecting into said mold and mounted on said fixed part for limited movement relative thereto, and a vibrator for oscillating said core-rod to fill said mold uniformly and to produce tablets of uniform density.

4. In a tablet-compressing machine having a pair of co-operating punches mounted for movement towards and away from each other and having a mold located to receive the operating ends of said punches therein, a fixed part of said machine, a core-rod projecting through said fixed part and into said mold, lock-nuts adjustably securing said core-rod in said fixed part, and a vibrator for oscillating said core-rod to fill said mold uniformly and to produce tablets of uniform density.

FRANCIS J. STOKES.