

Sept. 15, 1953

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2,651,980

MACHINE FOR COMPACTING MATERIALS

Filed Dec. 13, 1948

2 Sheets-Sheet 1

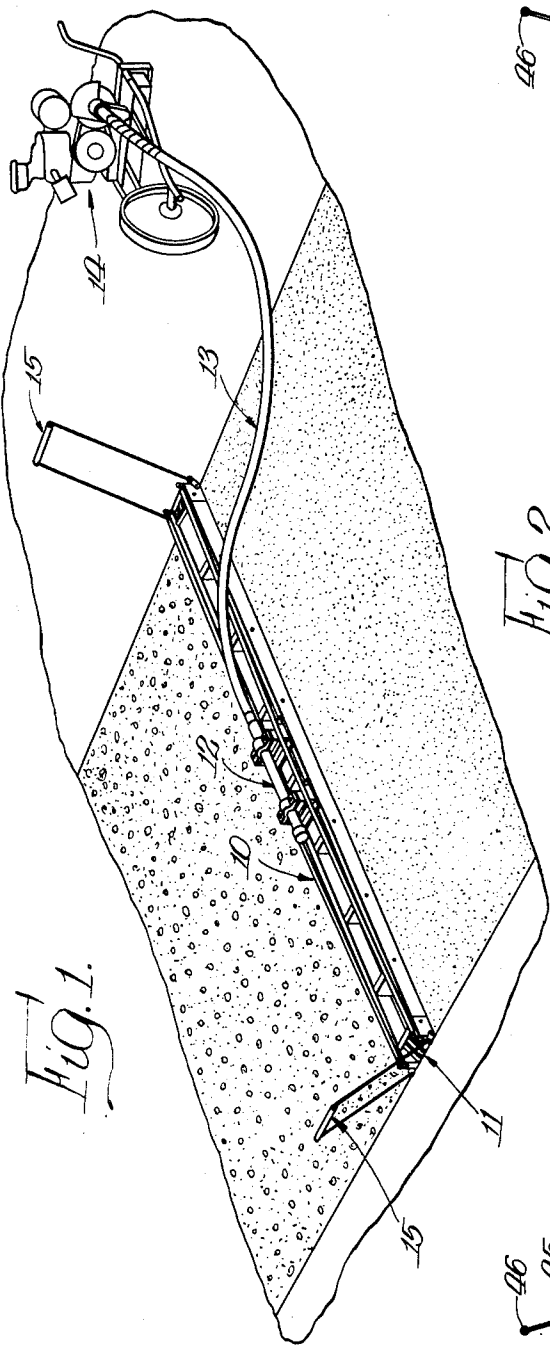


Fig. 1.

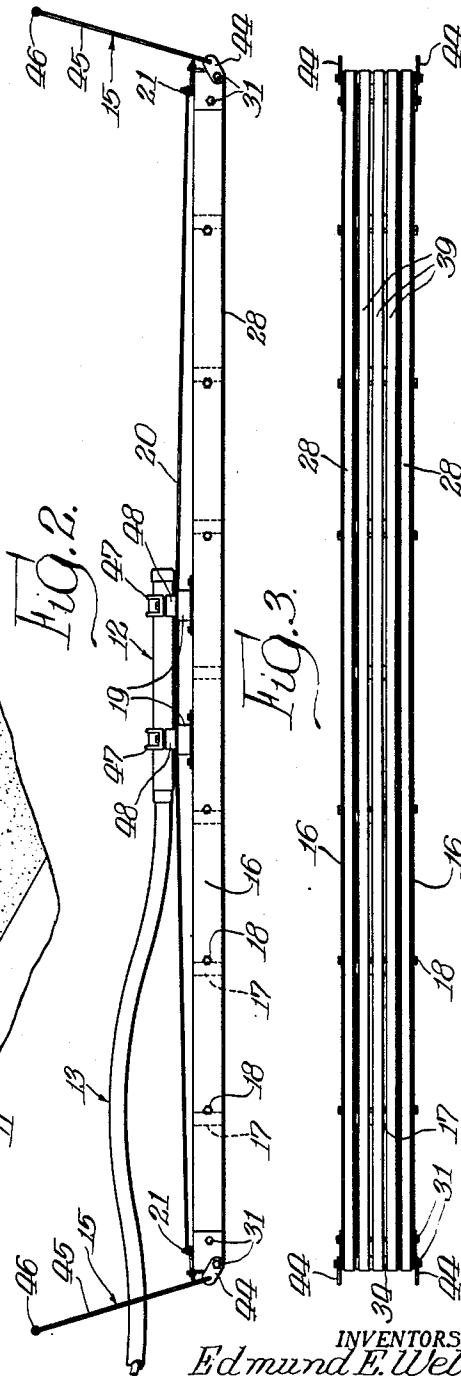


Fig. 2.

Fig. 3.

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Sept. 15, 1953

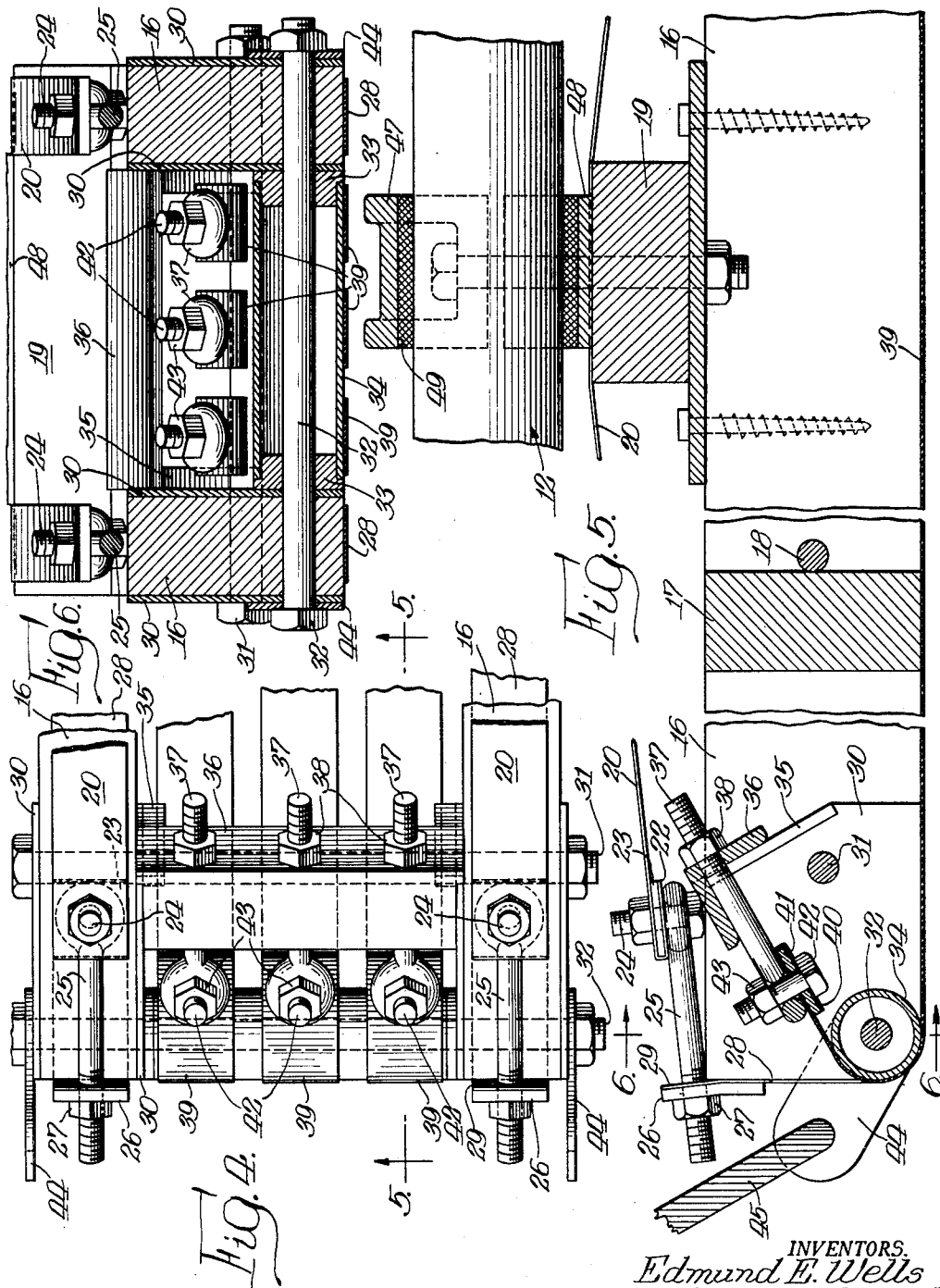
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2 Sheets-Sheet 2



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2,651,980

MACHINE FOR COMPACTING MATERIALS

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Application December 13, 1948, Serial No. 65,032

3 Claims. (Cl. 94—48)

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The invention relates to material handling equipment, machines or devices to be used for leveling, settling and/or compacting materials including sand, earth, crushed stone, concrete and, more particularly, to a vibrator device which may be manipulated by hand or carried by a mobile apparatus, machine or vehicle for smoothing, leveling, compacting or settling or other of the purposes for which it is adapted. In order to simplify this disclosure however, the invention will be illustrated and described in its application to a manually manipulated and easily constructed form of the device particularly adapted to the grading, screeding and compacting of concrete bodies such as floors, aprons, streets and like bodies.

Concrete, usually composed of an aggregate of cement and sand, gravel and rock of graded or miscellaneous sizes together with water, when mixed and laid or poured, generally contains many voids and, if not tamped, puddled or worked, would not result in a dense homogeneous body. Furthermore, it would have a rough and uneven surface which, after the concrete has partially set, would be difficult if not impossible to finish to provide a smooth and level or even surface. Again, if speed of laying and curing is a specification requisite, a minimum of water is employed in the mix which will then be "dry" to such degree that the concrete mix may be very difficult to pour, spread and smooth, and it may be equally difficult to eliminate voids and to provide a dense, strong and homogeneous mass. In such case also, even more so than with a "wet" mix, large and small pieces of rock or gravel of the aggregate may appear close to, at or above the desired final surface to interfere with any final leveling or other contouring or smoothing operations. In any event, therefore, a compacting, tamping, puddling, screeding or other type of operation is required following the laying or dumping of the mix when the specifications require removal of the voids, a particular density, a particular surface finish or contour, etc. Various devices have been designed to effect these ends.

One of the primary objects of the invention is to provide a vibrating device or apparatus whereby concrete and other materials may be compacted, levelled, smoothed, contoured to desired form, increased in density, de-watered and/or otherwise beneficially treated by vibration, in a simple and effective manner, in a minimum of time and with very little expense either by way of capital investment or by way of labor and other costs of operation.

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Other important objects are to provide a device of the character described which may be made in any desired size, one which may be adjusted to effect different periods or characters of vibration to meet varying conditions or consistencies, etc., of the material upon which the device is to operate or to produce different results, one which may easily be transported and one which may be incorporated in and as part of a stationary or mobile machine or apparatus as may be desired.

Many other objects as well as the advantages and numerous uses to which the invention may be put will be readily understood and appreciated after reading the following description and claims and after viewing the drawings in which:

Fig. 1 is a perspective view of the device chosen for illustration of the invention showing it in operation upon a slab of freshly poured concrete and in connection with one type of power operated vibration producing machine;

Fig. 2 is a side elevational view of the device shown in Fig. 1, but on a slightly larger scale;

Fig. 3 is a bottom plan view of the same;

Fig. 4 is a large scale detailed view in top plan of one end of the device shown in the preceding figures;

Fig. 5 is a sectional view taken substantially along the line 5—5 of Fig. 4; and

Fig. 6 is a vertical sectional view taken substantially along the line 6—6 of Fig. 5.

The essential elements of the machine chosen for illustration of the invention are a relatively rigid truss structure of sufficient strength and length to span or extend across the area, or such desired portion of the area, of the material to be compacted or otherwise treated, one, but preferably a plurality of relatively flexible bands or strips extending from end to end of the truss structure and suitably secured and supported thereon in such position and manner as to permit such band or bands to make contact with the surface of the material to be compacted or otherwise treated, and a suitable vibration creating mechanism such as a power driven vibrator by which the relatively flexible bands or strips and the truss or frame structure may be vibrated. The device or machine may be transported by hand for which purpose any suitable handles may be employed, or it may be attached to and movable with any other type of machine such as a machine for laying or mixing and laying concrete. The machine or device illustrated in Fig. 1, therefore, includes a box frame truss generally designated 10 of relatively rigid construction, a plurality of vibratory bands or strips generally

designated 11 and which extend from end to end of the truss on the underside thereof, a vibrating head generally designated 12 attached to the upper side of the truss and connected through a flexible shaft generally designated 13 with a portable power generating machine generally designated 14, and handle devices generally designated 15 by which the device or machine is moved about from place to place. The particular type and character of the power generating machine, by which the requisite vibrations are imparted to the truss and the vibratory flexible bands or strips, is not material so long as it produces a vibratory effect sufficient to cause the device to function in the intended manner.

Referring now more particularly to Figs. 2 to 6, inclusive, it will be observed that the truss is composed of a pair of relatively rigid longitudinal members 16, which may be composed of wood or metal, which are held rigidly in spaced parallel relation by transverse framing members 17 and bolts or ties 18, spaced at relatively equal distances apart throughout the length of the device. Secured to the longitudinal members at or adjacent to the center on the upper side of the truss are a pair of transverse blocks or supports 19, the outer ends of which serve as piers or compression members upon which rest a pair of truss supporting tension bands 20 which are suitably secured at their opposite ends 21 to the ends of the truss framing. Desirably, each end of each band 20 is reversely bent upon itself as indicated at 22, a square sided washer 23 is interposed between the band and its reversely bent end, and the band and its reversely bent end portion together with the washer are drilled through for the reception of a bolt 24, which also passes through the eye of eye-bolt 25, the shank of which passes through a bracket 26 which is secured in any suitable manner to the adjacent end of one of the longitudinal truss framing members. Nuts 27, threaded on the ends of the shanks 25 and engaging the brackets 26 serve to tension the bands 20.

Extending along the bottom surface of each of the frame members 16 and from end to end thereof is a flexible band 28, preferably of steel, the ends 29 of which may be appropriately and suitably anchored on the eye-bolt shanks 25, as will be more clearly apparent from Fig. 5. These bands may have a certain vibration periodicity with the truss framing itself and a secondary periodicity relative to the truss itself depending upon their tension and other factors such as the intervals at which they are secured to the longitudinal truss member 16, if they are in fact secured at intervals between the ends of those members 16. It will be understood, of course, that the bands 28 may be so anchored at their ends as to permit variation in the tension upon them, and that they may be secured to the longitudinal frame members 16 at spaced intervals throughout their length.

If the longitudinal truss frame members 16 are composed of wood, the sides thereof at their ends may be faced with steel plates 30 which are suitably drilled with registering apertures or holes for the passage of bolts 31 and 32 which extend transversely through the truss frame. Surrounding each bolt 32 and disposed with their backs against the inner plates 30 at each end of the truss frame are a pair of collared washers 33 which position and secure tubular members 34, which serve a purpose to be described. Either integral with the inner plates 30 or firmly secured

thereto in any suitable manner, at each end of the truss structure, is a transverse member 35 against and over the upper edge of which an angle bar 36 is disposed and supported. Each angle bar is drilled at predetermined spaced intervals through that leg which lies against the plate or member 35 for the reception of the shanks of eye-bolts 37 which are held thereto in an adjusted position by nuts 38.

Each eye-bolt 37 together with the angle bars 36 and members 35 serves as an adjustable anchor for one end of each of a series of bands or strips 39, the other ends of which may be similarly anchored, although one end of each anchor may be more or less permanently and non-adjustably secured. Each band or strip 39 extends the full length of the span of the truss, and at its end portions extends around the tubular members or rolls 34, above which the band or strip ends are bent back upon themselves as indicated at 40 for reception of square sided washers 41 and drilled to receive bolts 42 which pass through the eyes of eye-bolts 37 and are secured thereto by nuts 43. The bands or strips 39 preferably are composed of flexible strip metal such as steel, preferably extend parallel and in spaced relation to one another, as best illustrated in Figs. 2, 4 and 6, and lie in substantially the same plane, which would also be the plane in which the bands 28 extend. In some instances, as for example in the embodiment illustrated, the bands 39 may be positioned and limited against upward movement beyond a predetermined position by the bottoms of the transverse framing members 17 but, in other instances, may not be so limited, that is, the bottoms of the framing members 17 may be disposed sufficiently above the general plane in which the bands or strips 39 are normally disposed (while at rest) as to permit the bands to move freely upwardly to the limit of their amplitude of vibration. In some instances the bands may be firmly secured to the transverse framing members 17 which, if spaced a substantial distance apart, may serve as nodes between which limited amplitude of vibration of the bands or strips 39 may occur. In other instances, heavy coil springs may be substituted for the lower portions of the transverse framing member 17, thereby to abut the bands 39.

The device of machine thus described was designed to be moved about from place to place by hand, and to such end is equipped with a pair of apertured links 44, one end of each of which is held by the bolts 32. A cable or rope 45, on which a roller type handle 46 is threaded, is secured to the links 44 so that two men by lifting on the handles 46 may easily move the machine or device along as it performs its work and transport it from work place to work place. Vibration is imparted to the device illustrated by means of an unbalanced rotating element (not shown) within the vibrator head 12, which is firmly but removably clamped on the top of the truss by saddle clamps 47 bolted to pillow blocks 48, in turn secured to the blocks or transverse members 19. Material such as brake lining or the like 49 may be used to line the saddle clamps 47 and pillow blocks 48, thereby firmly to clamp the vibrator head 12. The unbalanced rotatable element within the vibrator head 12 is driven through the flexible shaft 13 which, in turn, is driven by a gasoline or electric or other motor as above mentioned. Flexible shaft driven vibrators of this character are well known and may

readily be purchased on the market from a number of sources.

In operation, the device or machine is placed with the bands or strips 39 against the material to be compacted or otherwise treated and the motor is started to drive the shaft, thereby to rotate the unbalanced element within the vibrator head 12. Depending upon the speed at which the flexible shaft is driven, vibrations of high, low or intermediate frequency are generated in the vibrator head which, being firmly clamped to and in effect forming part of the device described above, imparts its vibrations to the device through the truss and to the strips or bands 39, thereby inducing a slapping or pounding action by such bands. If the machine is operating on freshly poured concrete, whether the concrete is a "dry" or "wet" mix, the concrete becomes leveled or screeded and compacted so that the aggregates in the mass settle and become very dense, while enough fine materials are brought to the top to permit a monolithic finish without the addition of a dryer of any kind. Air pockets or voids within the mass disappear as air and excess water are brought to the surface, and coarse material is settled to a point at least slightly below the top surface of the concrete body so that a better, smoother and straighter surface may be obtained than with any other device with which we are familiar. The concrete will be left in so dense a mass that finishing operations generally may be started several hours sooner than when screeding is done by ordinary methods heretofore employed, and where machine finishing is to be used the concrete treated by our device will support the finishing machine much sooner than otherwise and finishing operations may proceed without interruptions.

A machine built after the manner of that specifically illustrated herein has been employed not only to compact, level and screed concrete, but also to compact sand fill, and serves its purposes in a most satisfactory manner. In this machine the truss side frame members were approximately twelve feet long and its width was approximately eight and three-quarters inches wide. The two side frame members were composed of wood, as were the cross members 17, which were placed eighteen inches apart, center to center. The bands 39 as well as the bands 28 were made from No. 20 gauge (.0375") steel, 1 1/4" wide, and were spaced 1/2 inch apart throughout their lengths. While the entire frame vibrates at the same rate as the vibrator head, and such vibration takes place in substantially all directions about the axis of the vibrator head and rotating element therein, the steel bands on the bottom of the device and between the sides of the frame will primarily vibrate up and down perpendicular to the surface of the material upon which they are operating, although they do and will have a certain amount of lateral movement relatively parallel to the material surface.

Although we have disclosed the invention in but a single form, it will be appreciated and understood that it is susceptible of embodiment in other forms and of various modifications, all without departing from the invention spirit and the scope of the appended claims.

We claim:

1. In a machine of the character described, a truss structure including a pair of spaced longitudinal side frame members and spaced transverse members bridging the space between said side frame members, spaced transverse connectors rigidly interconnecting said side frame members, a flexible metal band extending along the bottom of each side frame member, a plurality of relatively thin and flexible metal strips extending longitudinally of the structure along the bottom side thereof in spaced and relatively parallel relation to one another and between said metal bands, means adjustably connecting the ends of said strips to the opposite ends of the truss structure, and means mounted upon the truss structure intermediate the ends thereof for vibrating the truss structure and effecting vertical vibration of said metal strips.

2. In a machine of the character described, a truss structure including a pair of longitudinal side frame members and spaced transverse members bridging and substantially rigidly interconnecting said side frame members, a flexible metal band extending lengthwise of and disposed beneath each side frame member, a plurality of laterally spaced, relatively thin and flexible metal bands carried by said truss structure and extending longitudinally of the structure along the bottom side thereof and between said first mentioned metal bands and in relatively parallel relation to one another, means for varying the tension of said bands, and means for vibrating said truss structure and simultaneously vibrating said bands.

3. In a machine of the character described, a frame structure including a pair of relatively rigid longitudinal framing members and spaced relatively rigid transverse members secured to and spacing said longitudinal members, transverse truss supports mounted upon said longitudinal framing members intermediate the ends of said framing members, longitudinally extending truss supporting tension members resting on said supports and connected at their ends to the frame structure, a plurality of laterally spaced, longitudinally extending flexible metal bands secured at their ends to said frame structure across said transverse members, means for varying the tension of said bands and means for vibrating the frame structure and simultaneously vibrating the spaced bands vertically for tamping and compacting material therebeneath.

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