Oct. 25, 1949. K. A. RAYPHOLTZ 2,486,323

VARIABLE OUTPUT MIXING SYSTEM

Filed April 24, 1946

FIG. 1

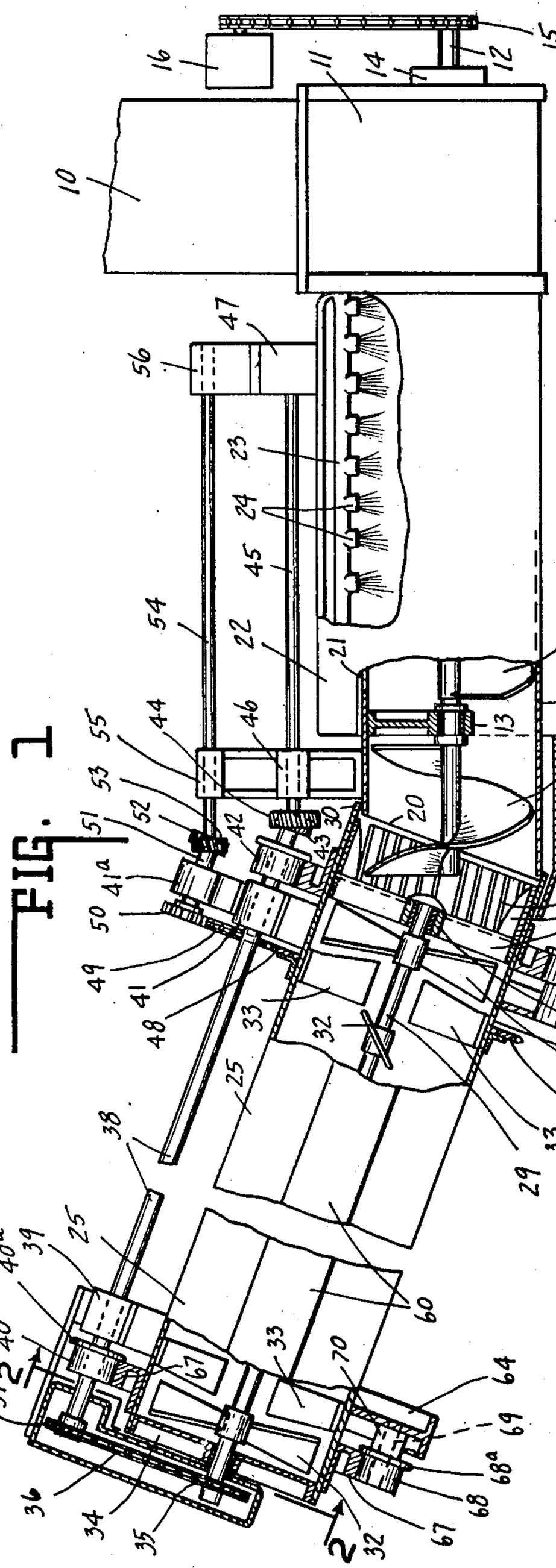
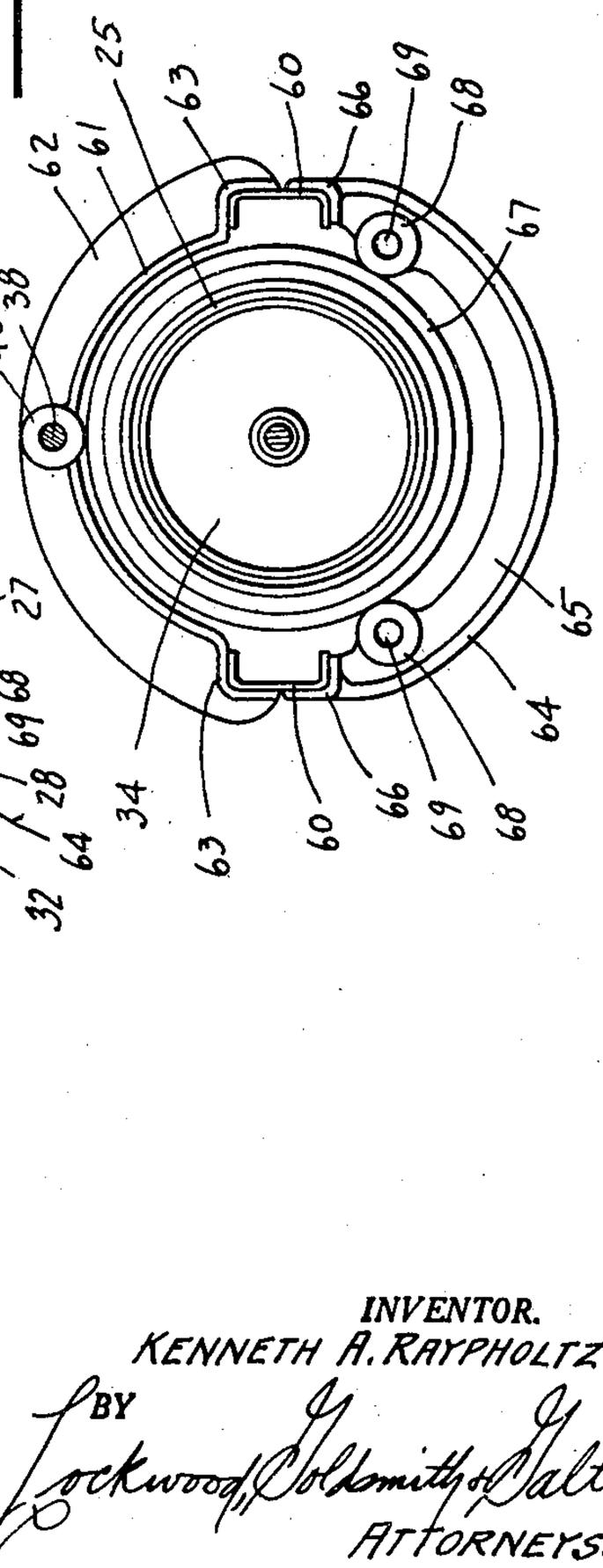


FIG. 2



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Patented Oct. 25, 1949

2,486,323

UNITED STATES PATENT OFFICE

2,486,323

VARIABLE OUTPUT MIXING SYSTEM

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Application April 24, 1946, Serial No. 664,490

1 Claim. (Cl. 259—165)

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This invention relates to a variable output mixing system and is particularly applicable to the mixing of aggregate and bituminous material to form a bituminous mixture suitable for roadway and like purposes.

The chief object of this invention is to insure adequate and proper mixing determinable by the character of the aggregate utilized and the bituminous material utilized and to provide for the proper mixing thereof and the maintenance of a rated output so that the device can be utilized for the continuous production of a bituminous mixture according to predetermined specifications and which will comply therewith.

The chief feature of the invention resides in the provision of a pug mill wherein the housing is rotated and a central screw therein can be rotated and the two rotated at different speeds and in the opposite directions, if desired, the speed differential providing the correct mixing of the aggregate and the bituminous material so that the bituminous mixture complies with the predetermined specifications.

Other objects and features of the invention will be set forth more fully hereinafter.

The full nature of the invention will be understood from the accompanying drawings and the following description and claim:

In the drawings Fig. 1 is an elevational view of an embodiment of the invention, parts being broken away to show the same and other parts in central section, the broken away portions being more particularly the adjacent ends of the pug mill proper and the bituminous material supply device and the discharge end of the pug mill structure.

Fig. 2 is a transverse sectional view through the pug mill structure.

In Fig. 1 of the drawings 10 indicates the discharge from an aggregate drier of any suitable type and the same discharges into the intake 11 of a bituminous applicator mounting a central shaft 12 at the discharge end by means of a bearing structure 13 and at the intake end by means of the bearing and seal 14.

The exteriorly exposed end of the shaft 12 may include driving means 15 operatively associated with a variable speed motor 16 which may be independently controlled to insure a predetermined speed of rotation of the shaft 12. The shaft 12 has secured to it the primary flight 17 and the supplemental or end flight 18, the two having their adjacent ends spaced by the forward bearing 13 aforesaid.

The screw enveloping tube 19 at its rearward

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end communicates with the housing portion 11 and its forward end is biased and open as at 20. The upper portion of this shell 19 is suitably apertured as at 21 and closing the same is a cover structure 22, the latter including a bituminous supply channel or header 23 having the aligned and spaced spray nozzles 24.

There are at least two parallel series of spray nozzles and same preferably are substantially coextensive with the cover 22 and the several series have a general direction of discharge towards each other. The supply for the liquid bituminous material is intentionally omitted for clearness.

It will be quite obvious that if a properly dried aggregate of the desired proportions is continuously supplied as at 11 to the intake end of the tube 19 that, as the screw therein is rotated, this aggregate is advanced through the tube. It is also carried upwardly and rotated by the screw. In its rotation the aggregate immediately beneath the spray nozzles is supplied with the liquid bituminous material in a regulated amount. Therefore, the resulting mixture as it discharges from the biased end 20 of the device aforesaid includes the proper amount of bituminous material and the proper amount of aggregate in the proper proportions.

However, as will be readily apparent, despite the spraying of the bituminous material upon the advancing aggregate, certain portions of the aggregate will be excessively coated and other portions may be devoid of bituminous material coating, or deficient in such coating. The mixture, such as it is, when discharged at 20 thus will comply with the specific requirements as to aggregate and bituminous material proportions but generally will not comply with the requirement that the same constitute a substantially homogenous mixture wherein the bituminous material is uniformly distributed throughout the aggregate.

Accordingly there is provided an additional mixer that takes the variously mixed bituminous material and aggregate from the discharge 20 and then further mixes the same so that uniformity and homogenization of the final bituminous mixture is attained and is maintained during the continuous operation of the device herein illustrated as long as a controlled supply of bituminous material and a controlled supply of properly proportioned aggregate is supplied to the spray device.

The means for supplying the same, and which form no part of the present invention, may be of any desired or required character. Devices suitable therefor are illustrated, described and

claimed in the two co-pending applications, to-wit: Serial No. 655,764, entitled "Continuous volumetric control apparatus" and Serial No. 649,515, entitled "Predetermined value control system."

These applications fully disclose apparatus for insuring proper aggregate and bituminous material proportioning and also disclose proper aggregate proportioning and substantially continuous supply of each from the discharge ends of each.

Referring to the central portion of Fig. 1 it will be noted that there is provided an open tube, shell, drum or housing **25**. The lower end thereof includes the vanes **26** adjacent a central bearing structure **27** carried by and within the said housing and providing a central bearing **28** for a shaft **29**.

Adjacent the immediate lower end **30** of the housing **25** and the biased end **20**, the biasing corresponding to the end **30** aforesaid, is a sleeve structure **31** in which the screw end **18** rotates and the housing **25** rotates. Thus, material discharged from the tube **19** by the flights **17** and **18** enters the open end of the rotatable housing **25** and is caused to advance therein by means of the vanes **26**.

The shaft **29** mounts inclined blades **32** as shown. These blades are generally radially disposed and diametrically positioned with respect to each other and each is inclined at an angle approximately 45°. In other words, they are biased, as it were.

Interposed between successive diametrically disposed blades **32** are other blades **33** which are also diametrically disposed and they clear the adjacent blades and terminate short of the shaft **29** so as to clear it as well. These blades **33** at their outer ends are rigidly secured to the interior of the rotatable housing **25**.

The upper end of the shaft **29** is supported in a housing supported bearing **34** at the upper end of the housing **25**. The shaft **29** projects beyond that upper bearing **34** and herein is shown provided with a sprocket gear **35** meshing with chain **36**, in turn meshing with sprocket pinion **37**, all of the aforesaid being enclosed, as by the stationary housing or elbow.

The sprocket **37** is carried by the upper end of the lay shaft **38**, which is rotatably supported in the bearing **39**. Interposed between sprocket **37** and the bearing **39** is the roller **40** to which reference will be had hereinafter.

The lower end of the lay shaft is rotatably mounted in the stationary bearing **41** and adjacent the immediate end thereof it mounts a roller **42** similar to roller **40** and aligned therewith. The immediate end of the shaft **38** mounts a helical gear **43** meshing with another gear of like character **44** carried by a shaft **45** suitably supported in the stationary bearing **46** and the same may be driven by a variable speed motor diagrammatically illustrated herein and indicated by the numeral **47**.

Adjacent the bearing **41** and rigid with the rotatable housing **25** is the sprocket structure **48** with which meshes chain **49**, in turn meshing with a sprocket pinion **50** carried by the shaft **51** supported in the bearing **41** as at **41***a*. The opposite end of the shaft **51** mounts the helical gear **52** and same meshes with a similar gear **53** carried by a shaft **54** also rotatably supported in the bearing **46** as at **55**.

The shaft **54** is driven by a variable speed motor diagrammatically illustrated herein and indicated

by the numeral **56**. Thus motor **56** determines the speed of rotation of the housing **25** and the motor **47** determines the speed of rotation of the shaft **29**. Thus the speed of rotation of the screw **17—18** is determined by the motor **16**, the speed of rotation of the vanes **33** is determined by the motor **56** and the speed of rotation of the vanes **32** is determined by the motor **47**.

It will be obvious that the shafts **54** and **45** can be rotated in opposite directions and also that the rates of rotation may coincide or be varied as desired or required and that such change in speed or speeds can be effected while the apparatus herein described is in operation. Also, the speed of the screw in the tube **19** can be varied if desired or required and while that device is in operation.

Accordingly, all of the aforesaid objectives are capable of accomplishment by the apparatus hereinbefore described.

It will be noted that the pug mill structure is inclined upwardly so that trucks and the like can be backed beneath the discharge upper end and the pug mill structure is of cantilever supported type. Herein at each side of the housing **25** there are provided supporting channels **60** and these are shown most clearly in Fig. 2.

Rigid with channels **60**, near the ends thereof, are the upper substantially semi-circular yokes **61** ribbed as at **62** and offset for channel clearance at **63**. Complementary semi-circular lower yokes **64** are inwardly flanged as at **65** and terminate in offset portions **66** by which same are secured to said channels.

The drum exterior includes peripherally arranged channel sectioned member **67** and same has associated therewith the roller **40** flanged at **40***a* and rotatably supported by lay shaft **38**. Similar rollers **68**, flanged at **68***a*, are rotatably supported by trunnions **69** mounted in bosses **70** rigid with yoke member **64**.

The periphery of rollers **40** and **68** rides the periphery of member **67** and the flanges of said rollers hold up, as it were, said shell or housing **25**. Both ends thereof are similarly supported and same is rotated by sprocket **48** and chain **49**.

Thus the mechanism described is capable of combining or mixing the rated output of the mechanism for the housing and inner screw can be differently rotated and at various relative speeds over a wide range, so that predetermined properly mixed rated output is obtained therefrom.

While the invention has been illustrated and described in great detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein, as well as others which will readily suggest themselves to persons skilled in this art, all are considered to be within the broad scope of the invention, reference being had to the appended claim.

The invention claimed is:

In combination with an aggregate feeding and bituminous material supply apparatus, a mixer adapted for continuous mixing including a rotatable housing, a coaxial screw therein, the apparatus substantially continuously discharging to one end of the housing, the resulting bituminous mixture discharging from the opposite end thereof, and adjustable driving means for adjustably and differentially rotating the housing and screw, the aggregate feeding and bituminous supply apparatus comprising a housing and a rotatable

agitator type conveyor therein, the latter terminating inmediately adjacent the discharge of the apparatus housing, the last mentioned discharge being coincident with the intake of the rotatable housing, the two housings disposed in end to end relation including an obtuse angular relationship therebetween.

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