

Aug. 28, 1951

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2,565,546

RADIAL FLOW ROTARY FEEDER FOR CONCRETE AGGREGATE

Filed Aug. 5, 1947

3 Sheets-Sheet 1

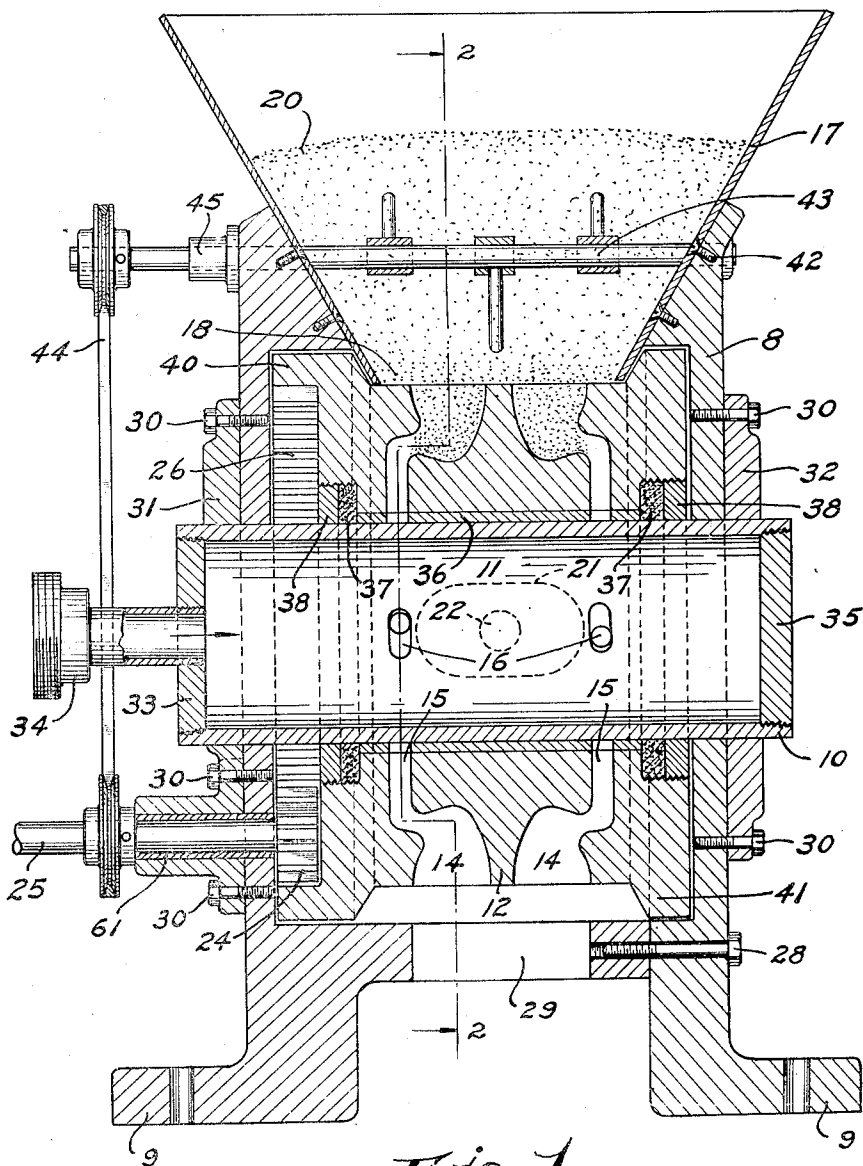


Fig. 1.

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3 Sheets-Sheet 2

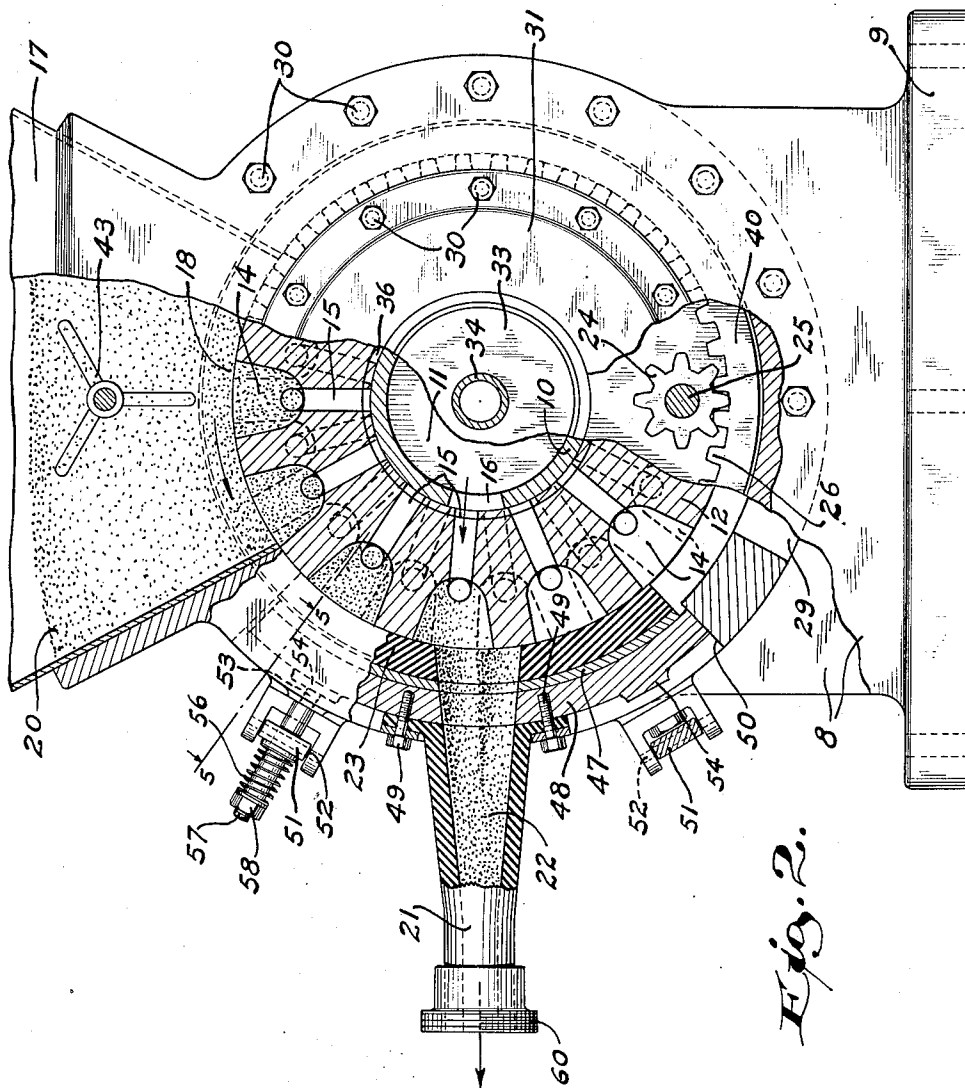


Fig. 2.

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3 Sheets-Sheet 3

Fig. 3.

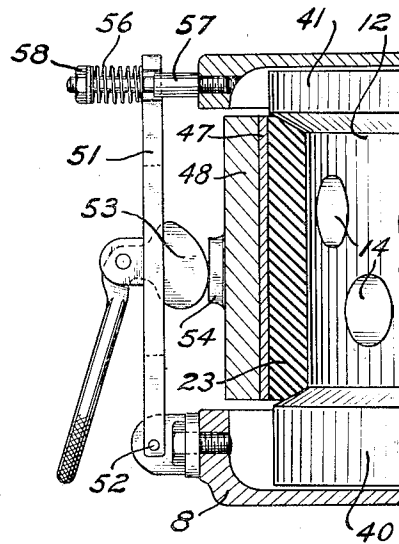
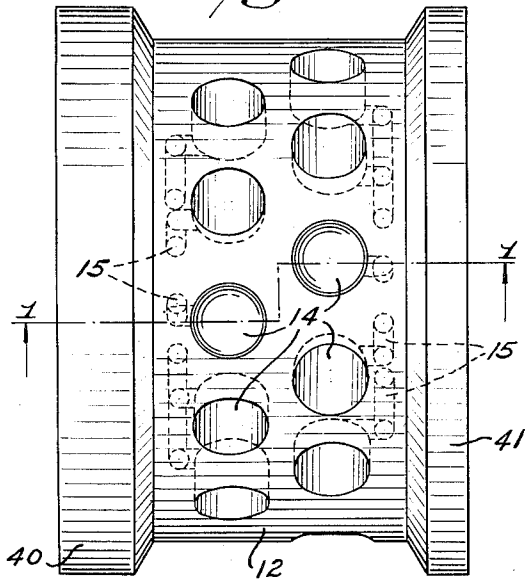


Fig. 5.

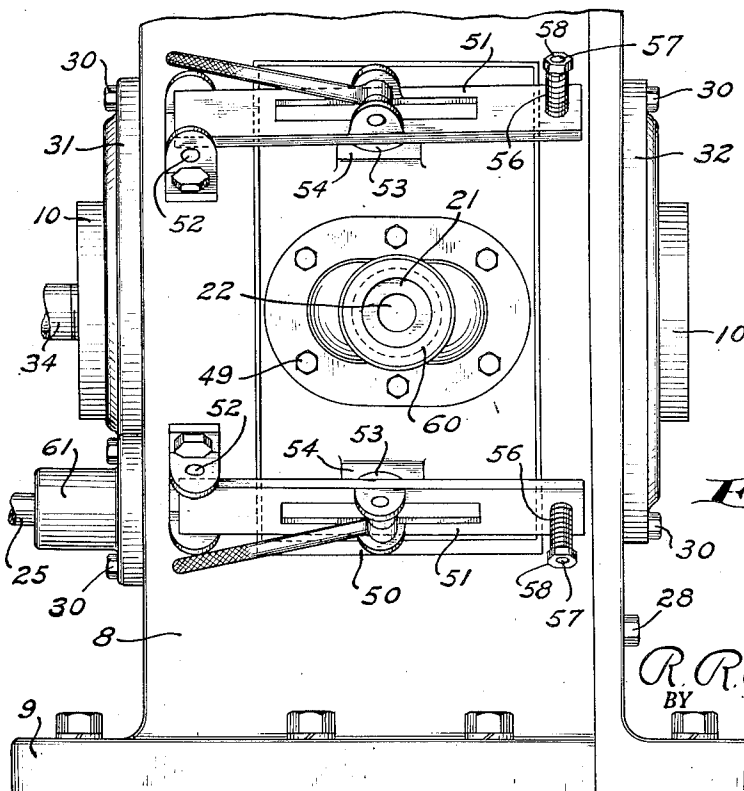


Fig. 4.

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UNITED STATES PATENT OFFICE

2,565,546

RADIAL FLOW ROTARY FEEDER FOR
CONCRETE AGGREGATE

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Application August 5, 1947, Serial No. 766,353

10 Claims. (Cl. 302—49)

1

My present invention relates in general to improvements in the art of mixing and transporting various materials pneumatically, and relates more specifically to improvements in the construction and operation mechanism for automatically feeding a continuous stream of dry concrete aggregate or the like from a source of supply to a zone of utilization thereof.

The primary object of this invention is to provide an improved feeder for finely divided dry material such as concrete aggregate, which is simple and compact in construction and highly efficient in operation.

Various types of compressed air feeders for handling relatively gritty and abrasive dry concrete aggregate and similar materials, have heretofore been proposed and used commercially with varying degrees of success, but most of these prior feeding devices besides being relatively cumbersome and complicated, are not sufficiently durable to withstand the abrasive action of the material and to avoid excessive air leakage for prolonged periods of time. It is preferable to have a feeding unit of this type portable so that it may be readily transferred from place to place, and the mechanism should therefore be as light and compact as possible, as well as being devoid of unnecessary complication. Then too, the surfaces of such feeding mechanisms, which are subjected to the action of the abrasive material flowing therealong, must be amply protected against excessive and rapid wear by means of relatively inexpensive and readily renewable wear resistant parts, in order to minimize the operating costs and to eliminate waste of the compressed air. None of the prior feeders of this type have met all of these requirements and they have therefore all proven objectionable for diverse reasons.

It is therefore a more specific object of my present invention to provide an improved feed unit for dry concrete aggregate, which besides meeting all of the above mentioned requirements, is adapted to deliver a uniform stream of the material to a nozzle or other zone of utilization.

Another specific object of the invention is to provide an improved automatic rotary feeder for dry finely divided abrasive material such as concrete aggregate, which is exceedingly simple and compact in construction and also comprises relatively few elements adapted to be quickly assembled or dismantled for inspection and renewal of parts.

A further specific object of this invention is to provide a durable feeder for gritty substances,

2

operable by compressed air, and in which all parts exposed to abrasion are well protected against rapid and excessive wear, and wherein leakage or undesirable escape of air under pressure is reduced to a minimum.

Still another specific object of my invention is to provide an improved feed mechanism wherein compressed fluid such as air or gas, is most effectively utilized to intimately mix and to continuously feed or transport finely divided dry granular material, with minimum attention on the part of the operator.

An additional specific object of my present invention is to provide an improved pneumatic feeder for concrete aggregate and the like, which may be manufactured and operated at relatively low cost, which is flexible in its adaptations, and all elements of which are conveniently accessible for lubrication, inspection and repairs.

Another specific object of the present invention is to provide a simplified rotary pneumatic measuring and feeding device for dry granular or pulverulent material, having a rotor provided with radial batch receiving and transfer pockets from which the successive batches are most effectively ejected by compressed air so as to produce a continuous and uniform stream flowing to the material utilizing zone.

These and other specific objects and advantages of my invention will be apparent from the following detailed description.

A clear conception of the features constituting my present improvement and of the construction and operation of a typical concrete aggregate feeder embodying the invention, may be had by referring to the drawings accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the various views.

Fig. 1 is a vertical section through a typical concrete aggregate feeder embodying the invention, taken centrally through the major portion of the unit, but along the irregular line 1—1 of Fig. 3 through the rotor;

Fig. 2 is an end elevation and partial transverse section through the same feeding unit, the section through the rotor having been taken along the line 2—2 of Fig. 1;

Fig. 3 is a side elevational view of the rotor alone of the feeder shown in Figs. 1 and 2;

Fig. 4 is a fragmentary outside view of the same unit, looking toward the final material discharge casing; and

Fig. 5 is a fragmentary radial section through

3

the feed mechanism, taken through the rotor seal along the line 5—5 of Fig. 2.

While the invention has been shown and described herein as being advantageously applicable to and embodied in a typical portable concrete aggregate feeder adapted to deliver a constant and uniform stream of dry granular or pulverulent material through a discharge conduit with the aid of compressed air, it is not my desire or intention to unnecessarily restrict the scope or the utility of the improvement by virtue of this limited disclosure.

Referring to the drawings, the improved portable concrete aggregate feeding unit shown, comprises in general a sturdy main frame 8 having a base portion 9 adapted to be mounted upon a truck for convenient transportation, and also having a horizontal central tubular casing 10 mounted therein and forming a compressed air supply chamber 11; an annular rotor 12 journaled for rotation upon the medial portion of the casing 10 within the frame 8, and having two similar annular series of outwardly open radial pockets 14 each provided with an off-set passage 15 at its inner end communicable with the chamber 11 through an adjacent port 16 formed in the casing 10; a dry concrete aggregate supply hopper 17 mounted upon the main frame 8 centrally above the rotor 12 and casing 10, and having a lower outlet 18 communicable with the successive rotor pockets 14 to admit batches of material 20 thereto; a material discharge casing 21 mounted upon one side of the frame 8 remote from the hopper outlet 18 and in horizontal alinement with the air supply ports 16, and forming a discharge conduit 22 also communicable with the successive rotor pockets 14 to receive the batches of material therefrom; an arcuate rubber seal plate 23 coacting with the periphery of the rotor 12 between the hopper outlet 18 and the conduit 22, and being resiliently urged against the rotor surface; and a driving pinion 24 carried by a horizontal propelling shaft 25 journaled in the frame 8, and coacting with an annular internal gear 26 formed in one end of the rotor 12, to constantly revolve the rotor in the direction indicated by the arrow in Fig. 2.

The main frame and rotor housing 8 may be formed of any suitable material and of separable sections adapted to be clamped together by means of bolts 28, and the lower portion of the frame 8 is preferably provided with a large inspection and clean-out opening 29 for the empty rotor pockets 14 and passages 15, as shown in Fig. 1. The cylindrical tubular casing 10 which forms the air supply chamber 11, may be firmly mounted and secured within the main frame 8 with the aid of opposite end plates 31, 32 secured to the frame by means of cap-screws 36; and one end of the casing 10 is provided with a closure plug 33 having an air supply fitting 34 associated therewith and communicating with any suitable source of compressed air supply, while the other end of this casing 10 is sealed by a solid plug 35. The chamber 11 is thus sealed against possible leakage or escape of compressed air, except through the ports 16.

The central bore of the material transfer rotor 12 is preferably provided with a renewable bearing sleeve 36 which snugly embraces and is rotatable about the medial portion of the tubular casing 10, and suitable packings 37 which are held in place by screw plugs 38 are provided between the rotor 12 and casing 10 at the opposite ends of the bearing sleeve 36, as illustrated in Fig.

4

1. The two series of pockets 14 formed in the rotor 12 may be of similar formation, and the successive pockets of each series may be spaced apart like distances, but as depicted in Figs. 2 and 3, the pockets 14 of one series are staggered relative to those of the other series so that the radial centerlines of the adjacent pockets of the two series do not lie in the same radial plane relative to the rotor axis. The outer open ends of the pockets 14 are of approximately the same width measured circumferentially of the rotor 12 as the corresponding width of the inlet end of the discharge conduit 22, and the staggering or off-setting of the pockets 14 of the two series insures communication between the conduit 22 and at least one pocket 14 of the rotor at all times.

The compressed air supply passages 15 which communicate with the inner ends of the radial pockets 14 may also be disposed radially relative to the rotor axis, but they are preferably off-set relative to their respective pockets as depicted in Figs. 1, 2 and 3, in order to prevent the passages 15 from becoming unduly filled with and perhaps clogged by finely divided material 20 when batches of this material are deposited within the pockets. The passages 15 may be formed directly in the rotor 12, and the latter is provided with opposite outwardly extending end flanges 40, 41 having inwardly inclined or tapered adjacent side surfaces merging with the cylindrical medial portion of the rotor in which the pockets 14 are formed. The passages 15 and the ports 16 with which these passages are communicable, may be located near the rotor flanges 40, 41 as shown, and the ports 16 which are disposed in horizontal alinement with the discharge conduit 22 should be of sufficient circumferential length to effect compressed air admission from the supply chamber 11 to the successive pockets 14 whenever the outer open pocket ends are brought into open communication with the conduit 22.

The material supply hopper 17 may be secured to the upper portion of the main rotor housing frame 8 in any suitable manner, as by screws 42, and the lower end of the hopper 17 in which the material delivery opening 18 is formed, rather snugly coacts with the tapered surfaces of the rotor flanges 40, 41 and with the cylindrical intervening portion of the rotor 12. The supply of material 20 within the hopper 17 may be continuously stirred by means of a rotary agitator 43 which may be constantly driven from the main propelling shaft 25 of the feeding unit with the aid of V-belt drive 44 or the like, thereby thoroughly mixing the concrete aggregate and also preventing bridging of the hopper outlet opening 18. The agitator 43 may be of any desired type, and may be journaled for rotation in bearings 45 carried by the main frame 8, and the material 20 is delivered from the hopper 17 to the successive rotor pockets 14 by gravity alone.

The lower discharge or outlet opening 18 of the hopper 17 is preferably of such length measured circumferentially of the rotor 12, that a considerable number of the pockets 14 will simultaneously communicate with the hopper, thus insuring substantial filling of the successive pockets. The distance between the hopper outlet 18 and the final discharge conduit 22 measured circumferentially of the rotor 12, should also be at least equal to, and preferably somewhat greater than the width of a pocket plus twice the distance between the peripheral openings of the successive pockets 14, in order to prevent escape of com-

5

pressed air from the conduit 22 into the hopper 17, and while the packings 37 will eliminate undesirable leakage and escape of compressed air along the casing 10, the periphery of the rotor 12 along the space intervening between the hopper 17 and discharge casing 21 must also be effectively sealed against such leakage.

The arcuate rubber sealing plate 23 which contacts with the rotor periphery between the flanges 40, 41 and with the tapered side surfaces of these flanges, performs the function of sealing the rotor periphery against possible leakage; and this renewable flexible sealing plate 23 is vulcanized to a metal backing plate 47 which is adapted to snugly engage an arcuate breast plate 48 to which the discharge casing 21 is firmly secured by cap screws 49. The breast plate 48 and the plates 47, 23 are loosely confined within a side recess 50 of the main frame 8, and are held within this recess 50 by a pair of levers 51 pivotally suspended from the frame 8 by pins 52 and carrying cams 53 at their medial portions which are cooperable with central bosses 54 formed on the plate 48, as shown in Figs. 1, 4 and 5. The swinging extremities of the levers 51 coact with helical compression springs 56 which embrace studs 57 secured to the frame 8, and the action of these springs 56 may be varied with the aid of adjusting nuts 58 coacting with threads on the studs 57, thereby providing means for resiliently urging the plates 23, 47, 48 toward the rotor periphery while also permitting convenient removal of the sealing elements.

The final material discharge casing 22 is preferably formed of wear resistant relatively flexible rubber so that it may be distorted laterally, and this casing is provided at its delivery end with a metal fitting 60 adapted to provide a connection with the usual flexible hose to which the nozzle or other concrete aggregate utilizing zone is attached. The conduit 22 is preferably tapered as shown in order to augment the velocity of the air and material mixture delivered through the casing 21; and the rotor and agitator propelling shaft 25 which may be driven from any suitable source, is journaled in a bearing 61 carried by the side plate 31 of the frame 8, while the driving pinion 24 coacts with internal gear teeth 26 preferably formed within the widest end flange 40 of the rotor 12.

When the improved concrete aggregate feeding unit has been properly constructed and assembled as hereinabove described, the driving shaft 25 may be connected to a suitable source of power, the compressed air supply fitting 34 should be connected to a source of compressed air through a shut-off valve, the final discharge fitting 60 may be connected to a nozzle or the like, the hopper 17 should be abundantly supplied with material 20, and the various parts of the mechanism may be properly lubricated and adjusted. As the rotor 12 subsequently revolves in the direction of the arrow in Fig. 2, the successive pockets 14 of both revolving series will be filled by gravity with batches of the material while advancing beneath the hopper outlet 18, and the agitator 43 will insure such filling and will prevent the material 20 from bridging across the opening 18.

The successive material laden pockets 14 will thereafter be transported along the arcuate rubber seal plate 23 and will be momentarily maintained sealed from communication with the hopper outlet 18 and with the discharge conduit 22, whereupon the advancing pockets 14 will be brought successively into open communication with the discharge conduit 22. Simultaneously

6

with the establishment of communication between the outer open end of each tapered pocket 14 and the conduit 22, the passage 15 at the inner end of the pocket will be brought into communication with the compressed air supply chamber 11 through the adjacent port 16, and compressed air will then flow outwardly through the passage 15 and through the corresponding pocket 14 and will eject the batch of material 20 therefrom into the discharge conduit 22.

The successive pockets 14 are thus automatically emptied by compressed air, and due to the staggering of the pockets 14 of the several series, material 20 will be injected into the conduit 22 continuously as the rotor 12 revolves. The outwardly tapering formation of the transfer pockets 14 insures complete ejection of the material batches therefrom, and the off-set disposition of the passages 15 prevents these passages from becoming clogged with material 20; and while the material is flowing through the tapered discharge conduit 22 its velocity is augmented and the particles are intimately mixed so as to produce a homogeneous and uniform stream of aggregate which is promptly delivered to the cement gun or other source of utilization.

The springs 56 serve to press the rubber seal plate 23 with the degree of pressure necessary to produce effective sealing, and this pressure may be readily varied by adjusting the nuts 58 upon the studs 57. The cams 53 may also be quickly manipulated with the aid of their actuating levers, to entirely relieve the pressure on the plates 23, 47, 48; and by removing the nuts 58 and springs 56 from the studs 57 and subsequently swinging the levers 51 out of the way, the plates 23, 47, 48 and the casing 21 may be entirely withdrawn from the recess 50 of the main frame 8. If the pockets 14 and ports 15 should become clogged, they may be cleaned through the lower inspection opening 29 of the main frame; and the rotor 12 may be freely removed from within the housing frame 8 upon removal of the seal plates and release of the hopper retaining screws 42, by merely removing the bolts 30 and separating the main frame sections.

From the foregoing detailed description it will be apparent that my present invention provides an improved automatic pneumatically actuated concrete aggregate feeding unit, which besides being exceedingly simple, compact and durable in construction, is also highly efficient in operation and flexible in its adaptations. The improved mechanism is obviously adapted to transfer and to deliver a uniform continuous stream of material 20 from the supply hopper 17 to the discharge conduit 22 while subjecting the parts to minimum abrasion and resultant wear, and undesirable leakage or escape of compressed air is positively eliminated. The lateral flexibility of the discharge casing 21 is especially useful when this casing is attached to a delivery hose; and by forming the casing 21 and the seal plate 23 of soft and flexible rubber, the wear on these elements is minimized and frequent replacements and repairs are avoided.

The radial disposition and outward enlargement or tapering of the pockets 14 and the off-setting of the air injection passages 15, is important in order to eliminate undesirable clogging; and the provision of several annular relatively staggered series of pockets 14 is likewise important in order to insure continuity of the stream of material 20 delivered from the assem-

blage. The improved driving mechanism for the rotor 14 and agitator 43 is obviously very simple but effective, and the driving members are amply protected against damage; and the entire unit may be manufactured and operated at moderate cost for diverse uses.

It should be understood that it is not desired to limit this invention to the exact details of construction and operation herein shown and described, for various modifications within the scope of the appended claims may occur to persons skilled in the art; and it is also contemplated that specific descriptive terms used herein be given the broadest possible interpretation consistent with the disclosure.

I claim:

1. In a concrete aggregate feeder, a rotor having an annular series of radial outwardly open pockets each provided near its inner end with an off-set passage formed to prevent inward flow of aggregate beyond the pocket, a supply hopper for delivering batches of material into said pockets through their outer open ends, a casing forming a discharge conduit communicable with the outer open ends of the successive pockets remote from said hopper, and means for injecting air into the inner ends of said pockets through said passages when the outer pocket ends are in communication with said opening to eject the material batches from the pockets.

2. In a concrete aggregate feeder, a rotor having several independent annular series of radial outwardly open pockets each provided near its inner end with a passage formed to prevent inward flow of aggregate beyond the pocket, a supply hopper for delivering batches of material into the open outer ends of the successive pockets of all of said series, a casing forming a discharge conduit communicable with said open outer pocket ends remote from said hopper, the pockets of the several series being staggered circumferentially of the rotor to constantly maintain at least two of the pockets in communication with said opening, and means for injecting air into said pockets through said passages when the corresponding pockets are in communication with said opening.

3. In a concrete aggregate feeder, a rotor having several laterally adjacent staggered series of equally spaced outwardly open pockets each provided near its inner end with a passage formed to prevent inward flow of aggregate beyond the pocket, a supply hopper for delivering batches of material into the successive pockets, a casing forming a discharge conduit communicable with the outer open ends of the successive pockets, and a compressed air supply chamber within said rotor having ports alineable with the successive passages of all of said series to inject air through the corresponding pockets whenever the open pocket ends are brought into communication with said conduit.

4. In a concrete aggregate feeder, a rotor having an annular series of pockets open at the rotor periphery and each provided near its inner end with a lateral passage formed to prevent inward flow of aggregate beyond the pocket, a supply hopper for delivering concrete aggregate into the successive pockets during revolution of said rotor, a casing forming a discharge conduit remote from said hopper and which is communicable with said pockets at said rotor periphery, means for injecting compressed air through said passages into the successive pockets when in communication with said conduit, and a rubber seal coacting with the

periphery of said rotor between said hopper and said conduit for preventing escape of compressed air from conduit into the hopper.

5. In a concrete aggregate feeder, an annular rotor having a series of outwardly open radial pockets and being provided with outwardly extending flanges at the opposite sides of said series, a supply hopper for delivering concrete aggregate by gravity into the successive pockets through their outer open ends, a casing forming a discharge conduit communicable with the outer ends of the successive material laden pockets, means for injecting compressed air outwardly through said pockets while in communication with said conduit, and driving means coacting with said rotor within one of said flanges for revolving said pockets about the rotor axis.

6. In a concrete aggregate feeder, a rotor having two relatively staggered annular series of pockets open at the rotor periphery, the inner end of each pocket being provided with a laterally off-set passage formed to prevent inward flow of aggregate beyond the pocket, a supply hopper for delivering concrete aggregate into the successive pockets of both series during revolution of said rotor, a casing forming a discharge conduit remote from said hopper and which is communicable with the pockets of both series at said rotor periphery, means for injecting compressed air through said passages into the successive pockets of both series when in communication with said conduit, and a rubber seal coacting with the periphery of said rotor between said hopper and said conduit for preventing escape of compressed air from the conduit into the hopper.

7. In a concrete aggregate feeder, a rotor having an annular series of pockets open at the rotor periphery and each provided near its inner end with a passage formed to prevent inward flow of aggregate beyond the pocket, a frame providing a housing for said rotor, a supply hopper for delivering concrete aggregate into the successive pockets during revolution of said rotor, a flexible rubber casing forming a discharge conduit remote from said hopper and which is communicable with the outer open ends of said pockets, means for injecting compressed air through said passages into the successive pockets when in communication with said conduit, an arcuate rubber seal coacting with the periphery of said rotor between said hopper and said conduit, a rigid arcuate breast plate coacting with the exterior of said seal and providing a direct support for said rubber casing, and means for detachably attaching said plate to said rotor housing.

8. In a concrete aggregate feeder, a rotor having several relatively staggered annular series of outwardly enlarging radial pockets each provided near its inner end with an off-set passage formed to prevent inward flow of aggregate beyond the pocket, a supply hopper for delivering batches of material into said pockets, a casing forming a discharge conduit communicable with the larger outer open ends of said pockets remote from said hopper, and means for injecting compressed air into the smaller inner ends of the successive pockets to eject said batches from said pockets into said conduit.

9. In a continuous feeder for granular material, a rotor having an annular series of radial outwardly open pockets each provided with an air injection passage having its outlet end off-set relative to the adjacent pocket to prevent inward flow of granular material beyond the pocket and having a radially disposed inlet end, a supply

hopper for delivering batches of material into said pockets through their outer open ends, a casing forming a discharge conduit communicable with the outer open ends of the successive pockets remote from said hopper, and means for injecting air into the inner ends of said pockets through said passages when the outer pocket ends are in communication with said opening to eject the material batches from the pockets.

10. In a continuous feeder for granular material, a rotor having several relatively staggered annular series of radial outwardly open pockets each provided with an air injection passage having its outlet end off-set relative to the adjacent pocket to prevent inward flow of granular material beyond the pocket and having a radially disposed inlet end, a supply hopper for delivering batches of material into said pockets, a casing forming a discharge conduit communicable with the outer open ends of said pockets remote from

said hopper, and means for injecting compressed air into the inner ends of the successive pockets through said passages to eject said batches from said pockets into said conduit.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,041,548	Wilson	Oct. 15, 1912
1,096,785	Jensen	May 12, 1914
1,777,043	Lanhoffer	Sept. 30, 1930
1,953,091	Westberg	Apr. 3, 1934
1,997,791	Hoberg	Apr. 16, 1935

FOREIGN PATENTS

Number	Country	Date
378,879	Germany	Aug. 7, 1923