April 14, 1942. N. J. QUINN 2,279,342

ABRASIVE PROJECTING APPARATUS

Filed May 25, 1935 2 Sheets-Sheet 1

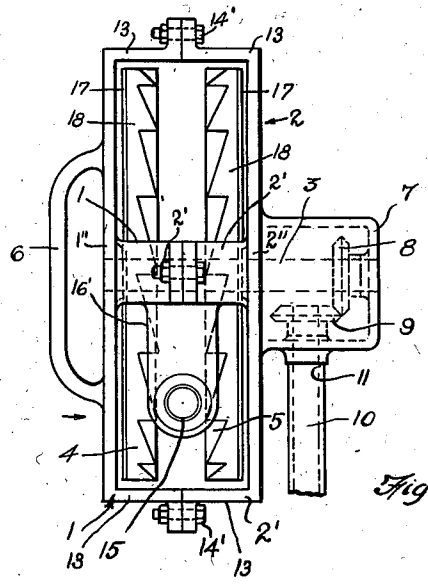


Fig. 1

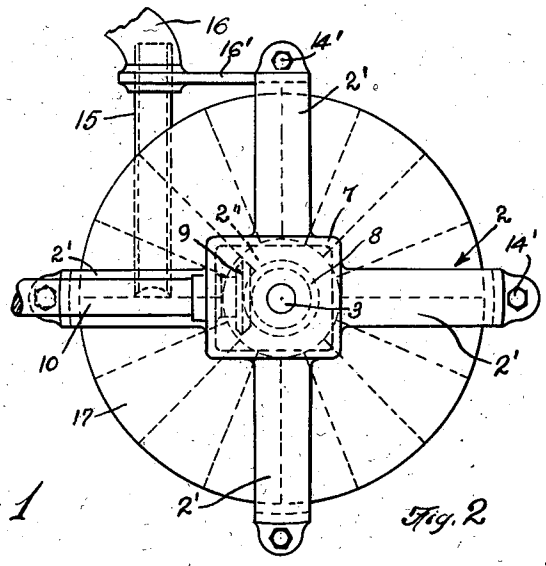


Fig. 2

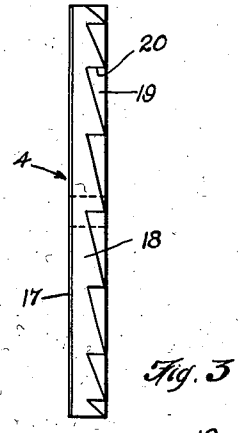


Fig. 3

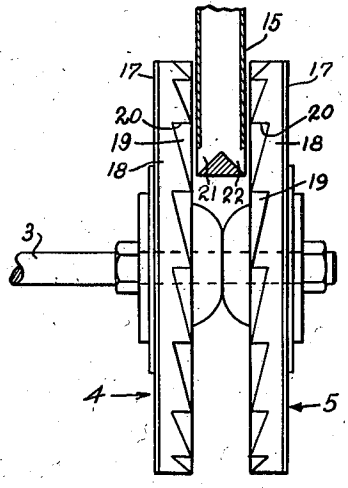


Fig. 5

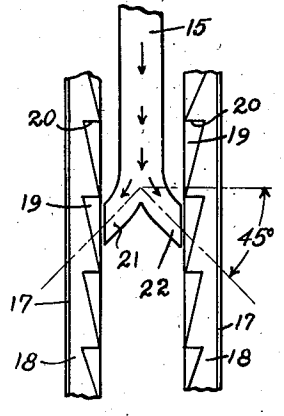


Fig. 6

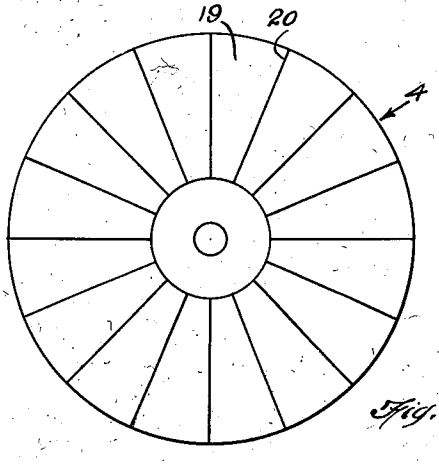


Fig. 4

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ABRASIVE PROJECTING APPARATUS

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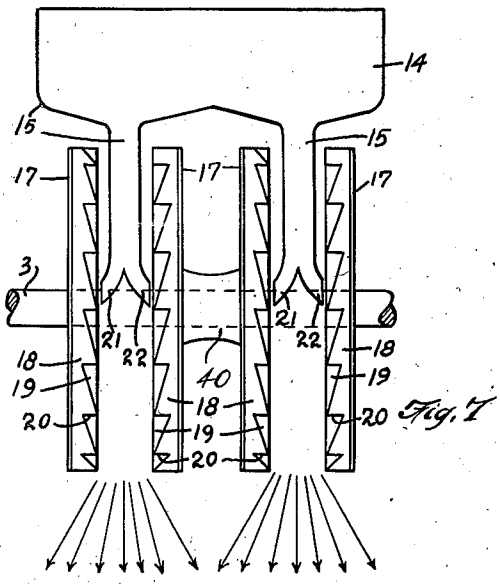


Fig. 7

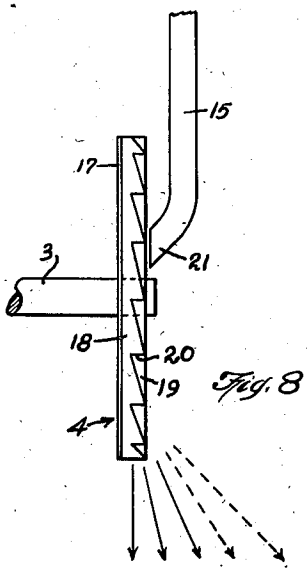


Fig. 8

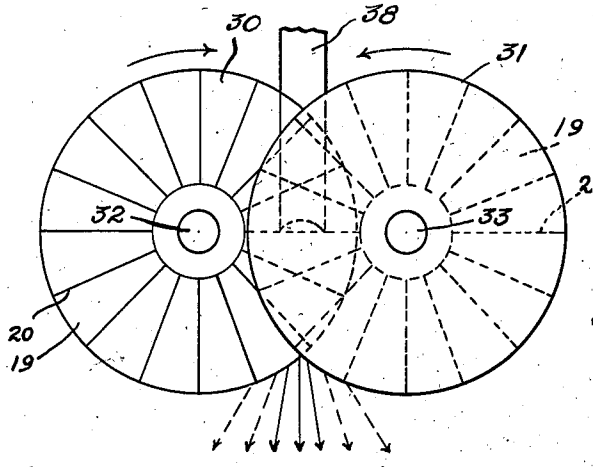


Fig. 9

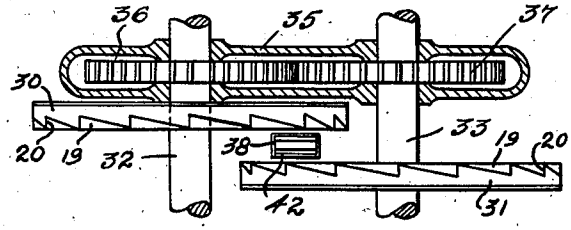


Fig. 10

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ABRASIVE PROJECTING APPARATUS

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Application May 25, 1935, Serial No. 23,474

11 Claims. (Cl. 51—9)

The present invention, relating as indicated to abrasive projecting apparatus, is more particularly directed to a new and improved method and apparatus for projecting finely divided material having abrasive action, such for example as sand, metallic grit, or even particles of materials which can be employed to treat or coat surfaces. The principal purpose of the present invention is the provision of simple and economical apparatus for projecting finely divided material of the character and for the purpose stated, at high speed with a minimum of power and by a mechanical action which makes it unnecessary to employ the large volume of high pressure air which is now commonly employed in the projecting of such material, and which accounts for much of the expense of such operations.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means and steps hereinafter fully described and particularly pointed out in the claims; the annexed drawings and the following description setting forth in detail certain means and one mode of carrying out the invention, such disclosed means and mode illustrating, however, but one of the various ways in which the principle of the invention may be used.

In said annexed drawings—

Fig. 1 is a plan view of my improved apparatus;

Fig. 2 is a side elevation of the same;

Fig. 3 is a plan view of one of the abrasive projecting wheels;

Fig. 4 is a side elevation of the wheel of Fig. 3;

Fig. 5 is a front elevation of two wheels mounted in cooperative relation to each other and to the feeding means;

Fig. 6 is a plan view showing the relation between the feeding means and the wheels;

Fig. 7 is a plan view, partly diagrammatic, showing the use of a plurality of projecting devices;

Fig. 8 is a plan view, partly diagrammatic, illustrating a single projecting wheel and the discharge secured therefrom;

Fig. 9 is a front elevation of a modification of my improved apparatus; and

Fig. 10 is a plan view of the same.

My improved abrasive projecting apparatus consists of a supporting structure formed from two complementary spider frames 1 and 2, as shown in Figs. 1 and 2. Spider frame 1 comprises a plurality of spaced arms 1' which radiate from a common hub portion 1''. The spider frame 2 also comprises complementary spaced arms 2' which radiate from a common hub portion 2''. The arms 1' and 2' are arranged in pairs and have the ends thereof turned inwardly at 13 so that they may be secured together by suitable bolts 14, as shown in Figs. 1 and 2. Thus the spider frames 1 and 2 are firmly secured together to provide a cage-like supporting structure.

A shaft 3 is rotatably mounted in the hub portions 1'' and 2'' of the spider frames 1 and 2 so as to rotate freely therein. A pair of spaced abrasive projecting wheels 4 and 5 are secured to the shaft 3 within the spider frames 1 and 2. The hub portion 2'' of spider frame 2 is provided with a projecting gear box 7 into which the end of shaft 3 extends. A bevel gear 8 is secured to the shaft 3 within the gear box 7 and is in driving engagement with a bevel gear 9 contained within the gear box 7, the gear 9 being secured to the end of a flexible shaft 10 extending through an appropriate opening 11 in gear box 7. The flexible shaft 10 may be driven by any suitable means, such as an electric motor, which is not shown. A convenient handle 6 is secured to the spider frame 1 so that the apparatus may be manually held or suspended as desired.

Abrasive is supplied to the abrasive throwing wheels 4 and 5 by means of a feed pipe 15 which extends between the abrasive throwing wheels 4 and 5, as illustrated more particularly in Figs. 2 and 5. The feed pipe 15 is supplied with abrasive by means of a suitable gravity conduit 16 which may lead from a gravity reservoir 14, as diagrammatically illustrated in Fig. 7, or the abrasive may be supplied to gravity conduit 16 by any suitable abrasive conveying mechanism, not shown. The feed pipe 15 may be suitably supported by means of a bracket 16', as shown in Figs. 1 and 2, suitably secured to the spider frames 1 and 2.

Abrasive throwing wheels 4 and 5 may be identical in construction except that one is a left-hand wheel and the other a right-hand wheel, as illustrated in Figs. 1, 5 and 6. Each abrasive throwing wheel consists of a metallic disc 17, to which is integrally bonded a pad 18 of rubber or similar yieldable material, which is provided with a series of radially extending recesses 19. Each recess is fan shaped in cross-section, which results in a blade forming shoulder or projecting ledge 20 at the rear of the recess. The wheels are so operated as to turn in a direction which will bring the ledge 20 at the rear of each recess 19, taking into account the direction of rotation.

Abrasive material is supplied to the abrasive

projecting wheels 4 and 5 by the conduit 15 in the manner indicated in Fig. 6. This conduit at its lower end branches into two discharge nozzles 21 and 22, as shown in Figs. 5 and 6, the general plane of each nozzle being at substantially 45 degrees to the plane of the surface of the adjacent disk. The nozzles terminate closely adjacent to the outer surface of the blade forming shoulders 20 and feed material into the recesses 19.

It is possible to use in single wheel, supplying material thereto in the manner indicated in Fig. 8, but if the single wheel is employed part of the material bounces away from the surfaces of the recesses 19 before being carried around a sufficient distance to be discharged with any real velocity, and hence a single wheel is very much less efficient that two wheels. With two closely spaced wheels the material which is thrown off axially by one wheel is caught by the other and substantially all of the material is carried through a certain portion of one revolution of the wheels and is then discharged in a pattern which may be represented by the full lines shown in Fig. 8. The additional dotted lines in the same figure represent the additional scattering which occurs when a single wheel is employed. It is desirable, however, that the material scatter slightly axially of the wheels in the manner shown in Fig. 7.

The operation of the apparatus is of course to pick up the material fed from the conduit 15, imparting to this material the velocity of the blade forming shoulders 20. Some of the material when fed against the wheels immediately lodges against the rear edge of the blade forming shoulders 20, and then moves outwardly along the shoulders 20 until thrown off by centrifugal force, while some of the material probably bounces back and forth between the shoulders 20 and recesses 19 until coming to rest against the shoulders 20 before being discharged. The portion of a revolution through which the material is carried will depend upon the speed of rotation of the wheels, the size of the material, the weight of the material and the diameter of the wheels, but I have found that two wheels approximately six inches in diameter will effectively project finely divided sand, such as is commonly used in sand-blast apparatus, after carrying the sand through approximately a quarter of a revolution and will spread the sand over a considerable area, but without too much scattering. The speed imparted to the sand depends of course upon the speed of rotation of the wheels, but at a speed of about 6500 R. P. M. sand can be projected with a velocity which will enable it to compete in results with sand which is blown in an air blast under a pressure of from 65 to 100 pounds. Very little power is required to project the sand in the present type of apparatus and a one-fourth H. P. motor is sufficient to drive two six-inch wheels at a speed of 6500 R. P. M. and discharge a sufficient amount of sand to clean such objects as buildings, castings and the like at a rate which compares favorably with the cleaning rate secured by a sand-blast apparatus requiring many times the power and many times the cost of operation.

In Fig. 7 I have shown an apparatus consisting of two individual units of the character already described, but mounted side by side upon a single shaft 3 with a spacing member 40 interposed between the adjacent disks 17 of the two cooperating pairs of wheels, and it will be evident that two or even more of the individual units may be mounted in such a relation, depending upon the width of the blast of abrasive which it is desired to play upon any given piece of work. Similarly, it will be understood of course that the present unit may be employed either in portable or stationary types of machines, although it particularly lends itself to portable machines by reason of the simplicity of construction and the small number of parts which makes it possible to produce a single unit of the size referred to above, in which the operating device held and manipulated by the operator will weigh not more than eight or ten pounds.

In Figs. 9 and 10 I have used two wheels 30 and 31 which, instead of being mounted coaxially as in the preceding form of apparatus, are mounted on spaced parallel shafts 32 and 33, respectively, which are carried in a suitable frame 35 with the wheels 30 and 31 overlapping for about one-third to two-fifths of their diameter. The wheels are rotated by means of gears 36 and 37, mounted respectively on the shafts 32 and 33 to rotate the wheels 30 and 31, in the directions indicated by the arrows in Fig. 9, that is, in opposite directions, so that the overlapping portions of the two wheels are both running in the same general direction, that is, looking at Fig. 9 from the top toward the bottom of the sheet. Each wheel is provided with recesses 19 on the face adjacent to the other wheel of the same type as the recesses 19 already described for wheels mounted coaxially, and material is supplied to the two wheels by means of a conduit 38 terminating in a bifurcated end portion 42, each part of which feeds material angularly into the recesses 19 of the two wheels. The advantage of this form of my apparatus is that the pattern of material thrown by the wheels is very much more symmetrical, particularly with respect to the position of the wheels than is the case where the wheels are mounted coaxially. For example, the pattern of thrown material is indicated by the dotted lines shown in Fig. 9 and material is here thrown equally to right and left of the central stream of thrown material indicated by full lines in Fig. 9. This gives some advantages in the operation of the machine, particularly when employed in portable form.

Substantially the same movement of material and substantially the same action of the wheels obtains in this form of apparatus. Very little of the material passes between the wheels without being engaged by one or the other, pocketed in the recesses 19 and then thrown at approximately the peripheral velocity of the disks. I have not shown any specific means for driving the gears 36 and 37, as these may be driven in any suitable manner, the particular drive depending of course upon whether the apparatus is to be employed in a stationary condition or a portable condition, and if portable, the drive will then be adapted to the convenience of the operator to permit the maximum amount of movement of the tool.

The term "abrasive" as used herein is intended to denote any material which has either an abrading action as such or an action on the surface of an article which permanently affects such surface either by the removal of material therefrom, the application of material thereto or a modification of the original condition of the surface.

Other forms may be employed embodying the

features of my invention instead of the one herein explained, change being made as regards the means and the steps herein disclosed, provided the elements stated in the following claims or the equivalent of such stated elements be employed, whether produced by my preferred method or by others embodying steps equivalent to those stated in the following claims.

I therefore particularly point out and distinctly claim as my invention:

1. In abrasive projecting apparatus, the combination of two spaced coaxially mounted rotatable disks having yieldable coatings on their adjacent surfaces and said coatings being provided with radial recesses and being arranged with such surfaces in opposed and cooperative relationship, means for feeding abrasive angularly to the recesses in each of said disks, and means for synchronously rotating said disks.

2. In projecting abrasive apparatus, the combination of two spaced coaxially mounted rotatable disks having yieldable rubber coatings bonded to their adjacent surfaces, said coatings being provided with radial recesses and being arranged with such surfaces in opposed and cooperative relationship, means for feeding abrasive at an acute angle to the recesses in said disks, and means for synchronously rotating said disks.

3. In abrasive projecting apparatus, the combination of two spaced coaxially mounted rotatable disks having yieldable coatings on their adjacent surfaces and said coatings being provided with radial recesses and being arranged with such surfaces in opposed and cooperative relationship, means for feeding abrasive at an angle of substantially 45° to said disks, and means for synchronously rotating said disks.

4. In abrasive projecting apparatus, the combination of two spaced coaxially mounted rotatable disks having yieldable coatings on their adjacent surfaces and said coatings being provided with radial recesses and being arranged with such surfaces in opposed and cooperative relationship, feeding means including a conduit disposed centrally between said disks and having bifurcated discharge nozzles adapted to feed material at an acute angle to each of said disks.

5. In abrasive projecting apparatus, the combination of two spaced rotatable disks mounted in parallelism and having radial recesses in their adjacent surfaces, said disks being mounted to have their edge portions in overlapping relation, means for feeding abrasive to the recesses in one of said disks, and means for rotating said disks in opposite directions.

6. In abrasive projecting apparatus, the combination of two spaced rotatable disks mounted in parallelism and having radial recesses in their adjacent surfaces, said disks being mounted with their edge portions in overlapping relation, means for feeding abrasive to one of said disks in the area thereof overlapping said other disk, and means for rotating said disks in opposite directions.

7. In abrasive projecting apparatus, the combination of two spaced rotatable disks mounted in parallelism and having radial recesses in their adjacent surfaces, said disks being mounted with their edge portions in overlapping relation, means for feeding abrasive to said disks within the overlapping portions thereof, and means for rotating said disks in opposite directions.

8. In abrasive projecting apparatus, the combination of two spaced discs mounted to rotate on parallel axes, each disc being provided with radially extending abrasive particle impelling surfaces and the discs being arranged so that portions of the radial faces of the discs are in opposed and adjacent cooperative relationship during the rotation of the discs, abrasive feeding means disposed to feed abrasive particles to the opposed and cooperative faces of said discs, and means for rotating said discs in opposite directions.

9. In abrasive projecting apparatus, the combination of spaced discs mounted to rotate on parallel axes, said discs being provided with radially extending abrasive particle impelling surfaces arranged to have portions of the impelling surfaces of the discs in opposed and cooperative relationship during the rotation of the discs, abrasive feeding means disposed to deliver abrasive particles to the opposed and cooperative faces of said discs, and means for rotating the discs in synchronism in opposite directions.

10. In abrasive projecting apparatus, the combination of two spaced discs mounted to rotate coaxially, said discs being provided with radially extending abrasive particle impelling surfaces, said discs being rotatively arranged so that portions of impelling surfaces are in opposed and cooperative relationship during the rotation of the discs, abrasive feeding means disposed to feed abrasive particles at the opposed and cooperative faces of said discs, means for rotating the discs in opposite directions, and a flexible conduit communicating with said abrasive feeding means.

11. In abrasive projecting apparatus, the combination of two spaced rotatably mounted disks having yieldable coatings on their adjacent surfaces and said coatings being provided with radial recesses and being arranged with such surfaces in at least partly opposed and cooperative relationship, means for feeding abrasive angularly to the recesses in each of said disks, and means for synchronously rotating said disks.

NELSON J. QUINN.