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NOZZLE FOR SAND BLAST APPARATUS

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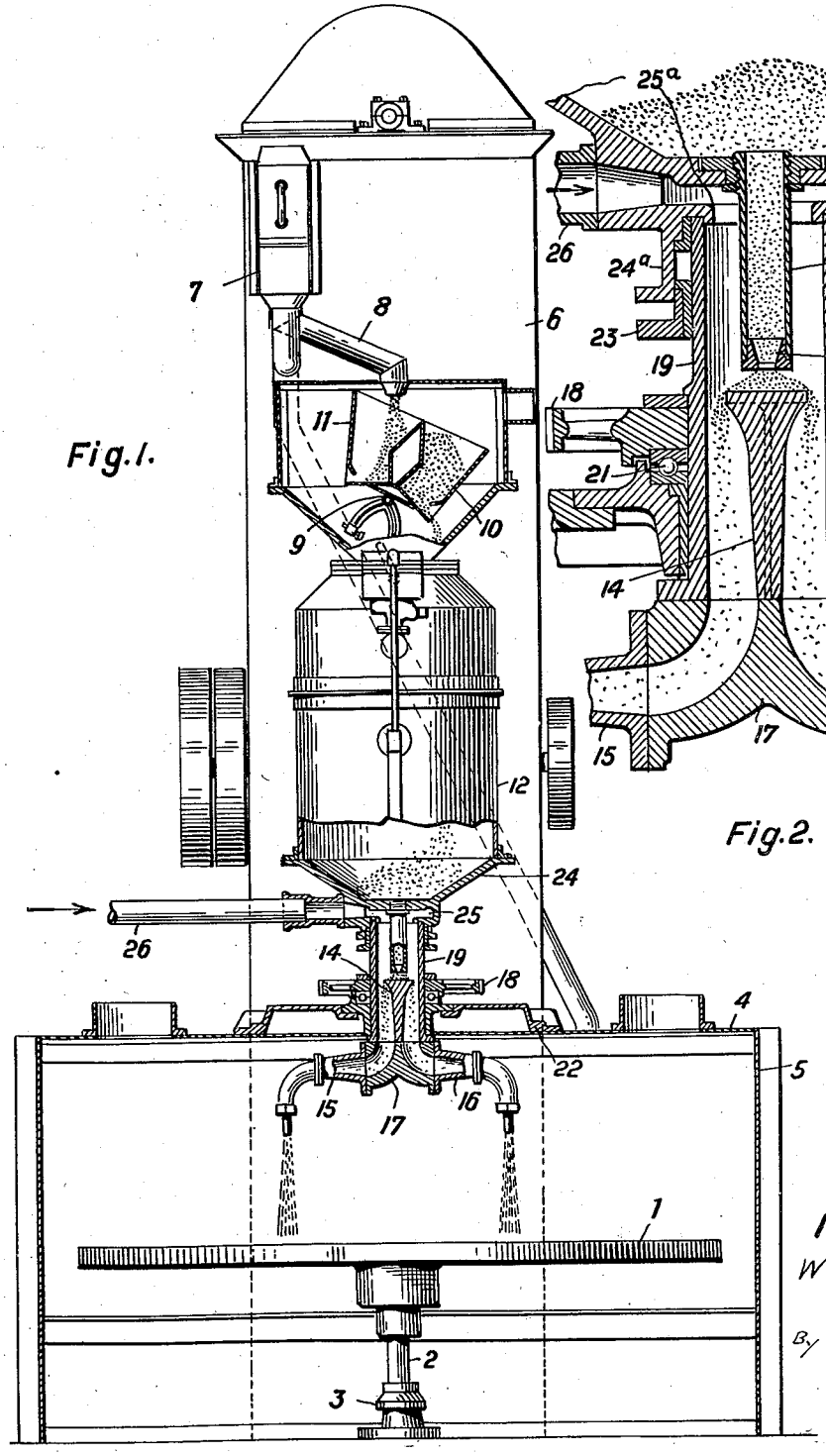


Fig. 1.

Fig. 2.

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NOZZLE FOR SAND-BLAST APPARATUS

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The present invention relates to a nozzle arrangement for sand blast apparatus in which the sand in a closed container is under the pressure of a column of compressed air, which enters below the sand container as well into a pipe into which the sand container continuously delivers accurately regulated quantities of sand which enter the interior of the pipe under the action of gravity. Such sand blast apparatus are provided for certain purposes, more particularly for playing on articles resting on a rotatable or reciprocating table surface, with revolving or oscillating nozzles.

According to the present invention in such revolving or oscillating nozzles for sand blast apparatus working under pressure, an arrangement is provided, which is intended to prevent the revolving or oscillating nozzles becoming stopped up, more particularly through sand which has become moist.

Most interruptions in the working of pressure-operated blast apparatus are due to the sand becoming moist. In most cases the stoppage occurs at places where the direction changes in the nozzle conveying the mixture of sand and compressed air. At these places where the direction changes the velocity at which the sand and compressed air mixture travels is changed, generally being reduced. Owing to the increased friction which occurs at the same time at these places, the sand which has become moist adheres to the sides and, after the moisture in the sand has dried out or evaporated, accumulations of adhering sand, which constantly increase, are formed, until finally the passage for the mixture of sand and compressed air becomes so narrow that it is no longer wide enough to fulfill its purpose at all. The stopped up places must then be cleared by first cleaning out the sand passages in the nozzles, in order that the sand blast apparatus can be put into operation again.

As the compressed air is in every case produced in compressors and heat is in any case developed in the compressors during the compression of the air, the moisture content in the air compressed in the compressors is not detrimental, as long as the heat in the compressed air keeps the moisture in the form of mist or vapour. Only when the heat drops to such an extent that the vapour changes to liquid condensates, will these small drops of water exert a detrimental effect on the sand admixed to the compressed air in the sand blast apparatus in the manner already referred to. Furthermore, as long as the mixture of compressed air and sand in the pipes connected to the sand container, more particularly in the passages of the nozzles, retains sufficient velocity of flow, the danger of the formation of liquid condensate from the moisture contained in the compressed air and consequently the danger of stoppages through sand which has become moist, is relatively negligible.

The danger, however, becomes great when the velocity of flow of the compressed air and sand mixture is greatly reduced or completely stops, which will always be the case when, from any cause, for instance for placing fresh articles to be cleaned on the table which lies below the revolving or oscillating nozzles or for altering the position of the articles on the said table, the latter has to be brought to rest. The reason for this is, that hitherto, for preventing the outflow of the compressed air and sand mixture from the nozzle which is put out of operation and for preventing damage, which would result through this continued outflow of the compressed air and sand mixture at a single place only, the compressed air cock and the sand supply cock have been closed. Through these interruptions in the flow of the compressed air the vapour carried along by the latter might be cooled off to such an extent that it would be converted into the liquid form and, on coming in contact with the sand, would moisten the latter to such an extent as to result in the formation of lumps and the occurrence of stoppages as explained above.

The object of the nozzle arrangement according to the present invention is to do away with the disadvantages described above by two different means. One such means consists in a particular way of supplying the air at the point where the air mixes with the sand. This peculiar way of supplying the air

is intended automatically to prevent the sand being carried along at the place at which otherwise the mixture of the air and the sand takes place, when only the revolving or the oscillation of the nozzles has previously been stopped, but the air supply itself need not be stopped. In addition to this in co-operation with the peculiar air supply below the opening which introduces the sand from the sand container into the compressed air, means are provided for catching and dispersing the sand, such that, shortly after the revolving or oscillatory motions of the nozzles have stopped, the further supply of sand is automatically interrupted, so that the compressed air which continues to flow out, receives no further admixture of sand and consequently can have no detrimental effect on the articles to be treated or on the person attending to the machine.

In the accompanying drawing showing a constructional example of the apparatus according to the invention,

Figure 1 is a front elevation of the pressure-operated sand blast apparatus in part vertical section through the sand container and the nozzle arrangement and rotary table lying below the same.

Figure 2 is a longitudinal section through the nozzle arrangement according to Figure 1, to an enlarged scale.

1 is a grid-like table mounted on the shaft 2 and journalled in the footstep bearing 3, which acts as the support for the articles to be cleaned and is positioned below the fixed cover plate 4 in a frame 5 which encloses the table with the exception of a charging opening which can be covered in a known manner by rubber curtains.

On the top of the frame 5 is another closed frame 6 in which is a bucket conveyor of the known kind (not shown) which conveys the used sand from the bottom of the frame 5 to the top, where it exposes it to the action of an exhaust fan which blows away the fine admixtures of dust and conveys the still useful grains of sand through a separator 7 and a downcomer 8 into a double hopper 10, 11 which rocks about the point 9. From the double hopper 10, 11, the sand passes in measured quantities into the sand container 12. All the parts described are known and do not form the subject of the present invention.

At the bottom of the same container 12 is a downwardly directed sand outlet passage 13 which discharges into a removable outlet opening 13^a which can be varied in diameter. The outlet opening 13^a is at a short distance above the surface of a plate 14, such that the sand falling down through 13, 13^a can accumulate on the surface of the plate 14^a till it forms a pile, the angle of slope of which bears such a relation to the distance of the parts 13^a, 14, that, when no vibrations are imparted to the plate 14, the apex of the angle of slope extends into the opening of 13^a, closing the said opening, so that the sand seeking to flow out of the opening 13^a has no outlet, but is checked in its motion. The parts 13, 14 are surrounded by a rotatable pipe 19 which is connected in a suitable manner, for instance screwed, to the nozzles 15, 16, which in the present instance are capable of revolving and are held together by a middle piece 17. This surrounding pipe 19 is driven by a toothed wheel 18 and rests on a ball bearing 21 provided on the part 22 of the frame resting on the cover 4. The surrounding tube 19 is shut off from the sand container 12 by a stuffing box 23. This is effected by the funnel-shaped casting 24, which forms the foot of the container 12, being constructed so as to form an annular air chamber 25 for the entrance of the compressed air flowing through the supply pipe 26, a saddle-shaped flange 25^a engaging over the upper end of the surrounding pipe 19. The compressed air entering 25 through 26, the pressure of which is the same as that of the column of air contained in the sand container 12, therefore flows over the bent-over flange 25^a downwards into the annular space lying between the parts 13, 14, on the one hand, and the inside of the wall of the surrounding pipe 19, on the other hand, and thence into the passages of the distributing pipe 17 and enters nozzle pipes 15, 16 which are bent over at an angle. This has the advantage that, should there by any chance be a stoppage in the annular space or in the passages of the parts 15, 16, 17, such a stoppage cannot result in a portion of the loose sand in the annular space being whirled upwards or even being forced into the gaps at the points between the rotating tubular part 19 and the tubular part 24^a surrounding the stuffing box 23. Such a penetration of sand into the gaps between the rotating and fixed part of the sand container would very soon result in considerable friction and in the said parts being badly worn, which would eventually cause considerable trouble in the operation of the apparatus. Should a stoppage occur in the annular space, the air entering at 26, 25 and flowing downwards would at least not be able to flow any further; it would stagnate, but would never cause the loose sand in the pipe 19 to whirl about or upwards.

As long as there is no stoppage in the annular space between the parts 13, 14, 19, the air entering at 26, 25 and flowing downwards always blows the annular space above the plate 13^a completely clean and prevents any grains of sand or dust from rising. It mixes at the gap between the plate 14 and the outlet opening 13^a evenly with the sand trickling downwards out of the pipe 13 over the angle of slope of the accumulation on the plate 14^a, as long as the vibrations due to the revolving or oscillating motion of the

nozzle parts adjoining the pipe 19 render such a trickling down of the sand unavoidable. On the toothed wheel 18 coming to rest, however, in which case these vibrations will cease, the accumulation of sand on the plate 14 will rise, forming a steeper angle of slope and will automatically close the opening 13a. so that no more sand will trickle down. The compressed air flowing through the annular space between the parts 13, 14, 19 will then force out only the remainder of the sand which, during the operation of the nozzles, has passed into the passages leading to the same. When all this sand has been removed from the nozzles in this manner, only the compressed air will continue to flow out of 26 and will escape unused without carrying sand along with it from the plate 14, as long as the operations which are performed while the turn table 1 is at rest, namely the turning over or the removal of the articles to be treated, continue.

Through the compressed air being blown out in this way any forming of condensate is prevented effectively. As compared with this prevention of disturbances in the operation of the apparatus the loss of compressed air during the periods of rest of the revolving or oscillating nozzles represents a relatively small disadvantage. It is all the more negligible in comparison with the advantages due to the prevention of interruptions in the operation of the plant, since the compressors in any case are not stopped during the various pauses in the operation of sand blast apparatus, but continue to operate.

What I claim is:

1. A blast nozzle arrangement for sand blast apparatus, comprising a sand container, an outlet for the sand at the bottom of the sand container, a revolving table underneath the sand outlet, a rotatable tubular member below the sand container, above the revolving table and surrounding the sand outlet, sand nozzles secured to the lower end of the rotatable tubular member, the said tubular member being adapted to guide sand from the sand outlet to the sand nozzles, an inlet for admitting a gaseous driving fluid into the rotatable tubular member, a sand accumulating member mounted inside the rotatable tubular member and underneath the sand outlet in such a position as to leave an annular gap between the tubular member and the sand accumulating member, the said gap leading to the sand nozzles, and the said sand accumulating member being adapted to spill sand uniformly into the annular gap whenever the nozzles are rotating, owing to the vibration caused by such rotation.

2. A blast nozzle arrangement for sand blast apparatus, comprising a sand container, an outlet for the sand at the bottom of the sand container, a revolving table underneath the sand outlet, a rotatable tubular member below the sand container, above the revolving table and surrounding the sand outlet, sand nozzles secured to the lower end of the rotatable tubular member, the said tubular member being adapted to guide sand from the sand outlet to the sand nozzles, an inlet for admitting a gaseous driving fluid into the rotatable tubular member, and a sand accumulating plate mounted inside the rotatable tubular member and underneath the sand outlet in such a position as to leave between the tubular member and the sand accumulating member an annular gap leading to the sand nozzles, the sand accumulating plate being so close to the sand outlet that when the nozzles are stationary a heap of sand accumulates thereon and projects into and closes the said sand outlet, and the said sand accumulating plate being adapted to spill sand uniformly into the annular gap whenever the nozzles are rotating, owing to the vibration caused by such rotation.

3. A blast nozzle arrangement for sand blast apparatus, comprising a sand container, an outlet for the sand at the bottom of the sand container, a revolving table underneath the sand outlet, a rotatable tubular member below the sand container, above the revolving table and surrounding the sand outlet, sand nozzles secured to the lower end of the rotatable tubular member, the said tubular member being adapted to guide sand from the sand outlet to the sand nozzles, an annular member closing the rotatable tubular member at the top and overlapping the upper edge of the said tubular member, an inlet in the said annular member for admitting a gaseous driving fluid into the rotating tubular member, and a sand accumulating plate mounted inside the rotatable tubular member and underneath the sand outlet in such a position as to leave between the tubular member and the sand accumulating member an annular gap leading to the sand nozzles, the sand accumulating plate being so close to the sand outlet that when the nozzles are stationary a heap of sand accumulates thereon and projects into and closes the said sand outlet, and the said sand accumulating plate being adapted to spill sand uniformly into the annular gap whenever the nozzles are rotating, owing to the vibration caused by such rotation.

In testimony whereof I have signed my name to this specification.

WILHELM ECKLER.