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Report 41/68

Exposure to Asbestos during the Servicing of Brakes of Passenger Cars

July 1968

Dr D E Hickish - 1/163
Industrial Hygiene
Specialist

Castleman
EXHIBIT NO. 1
7/20/01
Betty Browning

I INTRODUCTION

This investigation was undertaken in view of the increased national concern regarding exposure to asbestos, and of the impending revision of the Asbestos Regulations of the Ministry of Labour.

One of the operations within the motor industry which could involve exposure to asbestos dust is the cleaning of brake drums and clutch assemblies, normally carried out during routine servicing by "blowing-out" with compressed air jets.

The brake linings in current use may contain 40 to 60% asbestos when manufactured - the asbestos being normally in the chrysotile form, and occasionally in the amosite form. Crocidolite asbestos is said not to be used.

II FIELD INVESTIGATION

It was considered that any hazard to health from exposure to brake-drum or clutch dust would be more widespread within the Dealer Repair Organisation than within Ford of Britain, so the initial investigation was carried out at a large Main Dealer service bay. At this garage, the number of cars per day given a routine service varies between 10 and 20, but not all servicing involves brake cleaning.

Air sampling was carried out initially on two occasions, A and B, using thermal precipitators (T.Ps) as the sampling instruments. On the second occasion, samples were also collected on membrane filters. This latter technique has been developed in recent years, and is likely to become the preferred method of sampling for asbestos in Great Britain and the U.S.A.

... In

In each case, measurements were made:

(a) By the side of cars being given a service which included brake cleaning, and

(b) In the dust-cloud during brake cleaning, and then near to the car for the remainder of the service period.

As the mechanic normally blows the dust away from himself, the sampler at (b) would be exposed during "blow-off" to dust concentrations greater than those actually pertaining at the breathing zone. It was considered, however, that to sample in this way would provide an additional factor of safety. Details of the sampling are given in Table 1.

A further period of air sampling, C, was carried out, when membrane filter samples were collected from the breathing zone of the brake-clean operative, by means of a personal sampler, with suitably modified flow rate (approx. 250 cc/min.). The sampling covered an entire work shift, during which brake blow-out was carried out on the following vehicles:

5 Corsairs
1 Zodiac
4 Cortinas
1 Prefect

The thermal precipitator slides were subsequently incinerated and examined by micro-projection using a 4 mm objective and X.17 eyepiece. The membrane filter samples were rendered translucent by the addition of triacetin, and examined in a similar manner. Phase contrast microscopy was not used.

The results of the T.P. counts for occasions A and B are given in Table 2, and for the membrane counts on the

... occasions

occasions B and C in Table 3. The counts are expressed in terms of particles with diameter greater than 1μ, and of fibres (i.e. particles with aspect ratio greater than 3:1 and length greater than 5μ).

III LABORATORY INVESTIGATION

In view of the relatively few fibres present in the air samples, a laboratory investigation was undertaken, comprising microscopic examination of samples from brake lining material (which was filed to produce dust) and brake drum dust (collected by spatula from brake drums immediately prior to blowing-out). The samples were sieved through 200-mesh screens and then examined before and after incineration.

The results are shown as fibre proportions in Table 4.

Samples of material collected from the brake drums of (a) an Anglia van, (b) a Mark II Cortina, and (c) an Anglia car were analysed by Dr S Holmes of Messrs. Turner Brothers Asbestos Co.Ltd., and his findings are shown in Table 5.

IV DISCUSSION OF RESULTS

(a) Standards of dustiness

In June 1968, the British Occupational Hygiene Society published a Hygiene Standard for Chrysotile Asbestos Dust, which suggested that in order to reduce the risk of contracting asbestosis to 1% of those with a lifetime's exposure to the dust, the accumulated exposure should not exceed 100 fibre-years/cc, i.e. 2 fibres/cc for 50 years, or 4 fibres/cc for 25 years. In this standard, fibres are

... defined

Table 2. Results of Thermal Precipitator Samples

Sample No.	Sample details	Sample time mins.	Dust concentration	
			Particles/cc (>1μ)	Fibres/cc (>5μ)
	(a) Static - by car			
A1		30	99	2
A4		45	134	1
A6		30	62	2
	Time-weighted average		103	1.57
B1		45	124	0.5
B5		35	102	0
	Time-weighted average		115	0.28
	(b) In dust cloud, then static			
A2		30	71	3
A3		45	141	2
A5		35	92	0
	Time-weighted average		106	1.64
B3		45	103	0.5
B7		35	181	0.2
	Time-weighted average		137	0.37

Table 3. Results of Membrane Filter Counts

Sample	Details	Sample time mins.	Fibres/cc.
I. General atmosphere samples			
	(a) Static by car		
B2		45	1.12
B6		35	1.42
	Time-weighted average		1.25
	(b) In dust cloud, then static		
B4		45	1.71
B8		35	3.62
	Time-weighted average		2.55
II. Personal samples			
C1		60	0.63
C2		56	1.12
C3		59	0.21
C4		56	0.96
C5	Sample lost		
C6		64	0.38
C7		70	0.79
	Time-weighted average		0.68

Table 4. Fibres - as percentage of total particles observed

Sample	Fibre proportion - %	
	Un-Incinerated	Incinerated
Brake lining material	28	12.3
Brake drum dust	0.6	1.6
Air-borne dust	-	1.3

Table 5. Analysis of Brake drum dust

Sample	Electron diffraction microscopy	X-ray diffraction (normal specimen)	X-ray diffraction (extracted specimen)
1.Anglia Van	Chrysotile present	Iron & quartz present. No chrysotile detected.	Less than 5% chrysotile, possibly 0.1% to 1%.
2.Cortina Mk.II	"	"	Less than specimen 1.
3.Anglia car	"	"	As specimen 1.

Report 52/68

Exposure to Asbestos Dust during Brake Maintenance Operations on Commercial Vehicles, Fleet Repair Garage, Dagenham

October 1968

Dr D E Hickish - 1/163
Industrial Hygiene
Specialist.

8006 1213

I INTRODUCTION

This study was undertaken to assess the degree of exposure to fibrous dust in brake maintenance procedures on commercial vehicles and to provide comparative data relating to a previous study on operators working on passenger cars.

II INVESTIGATION

Air sampling took place in the garage on the 19th September 1968. Membrane filters, in conjunction with Casella personal samplers, suitably modified to provide a flow rate of 200 cm^3/min. were used and the following sampling procedure adopted.

(a) Personal samples were collected from the "brake blow off" operator (Mr Crone) and the mechanic working in the adjacent bay (Mr Hillman) during the blowing-off operation. The filters were then changed and replaced to run for the rest of the shift.

(b) Static samplers were positioned at three points, A, B and C, about 20-25' from the source of dust generation and separate samples were collected for the morning and afternoon shifts.

The sampling positions are shown in Fig.1.

The collected samples were subsequently removed to the laboratory and, after preparation, examined by projection microscopy for the presence of fibres greater than 5μ. (A fibre is defined as having an aspect ratio equal to, or greater than, 3:1).

... III RESULTS

III RESULTS

Table 1 shows the fibre counts per cm^3 for each sample collected.

IV DISCUSSION OF RESULTS

(i) Standards of dustiness

In a previous Report (41/68: Exposure to Asbestos during the servicing of brakes of passenger cars) reference was made to the Hygiene Standard for Chrysotile Asbestos Dust proposed by the British Occupational Hygiene Society. This standard suggested a Threshold Limit Value of 2 fibres/cm^3 for an exposure period of 50 years. Categories of dustiness were proposed as follows:

Dust Category	Concentration, fibres/cm^3 (averaged over 3 months)
Negligible	0 - 0.4
Low	0.5 - 1.9
Medium	2.0 - 10.0
High	10

(ii) Field Investigation

Static Samples

As the blowing-off operation took place in the early part of the morning shift, the concentrations obtained at the static positions during the afternoon shift (samples 8, 9, 10) probably represent the background contamination. Thus it can be seen that the generation of a dust cloud by blowing off dust from commercial vehicle brakes results in increased background contamination of 3 to 4 times the background level at any point within a radius of 20-25 ft.

The concentrations are all well below the TLV, and with one exception come within the "Negligible" dust category.

... Personal

Personal samples

The fibre concentrations for the mechanic engaged on the blowing-off task taken for the duration of the operation shows an exposure of nearly 4 times the TLV, while the concentration measured in the breathing zone of the mechanic working in the adjacent bay during the same period just exceeded the TLV.

The personal samples from the two mechanics taken over the remainder of the shift give similar results. When the samples for the two mechanics are calculated on the basis of time-weighted concentrations, the exposures are below the TLV and come within the "Low" dust category.

V CONCLUSIONS

In the light of the environmental data, and of the irregular intervals at which brake-cleaning is carried out (it is not a daily procedure) it does not appear that a significant hazard to health should occur in the case studied.

Nevertheless, the conditions which obtain during the blowing-out operation are extremely unpleasant, and alternative methods of cleaning should be investigated, or measures adopted to minimise personal exposure, e.g. local ventilation, or use of a suitable respirator.

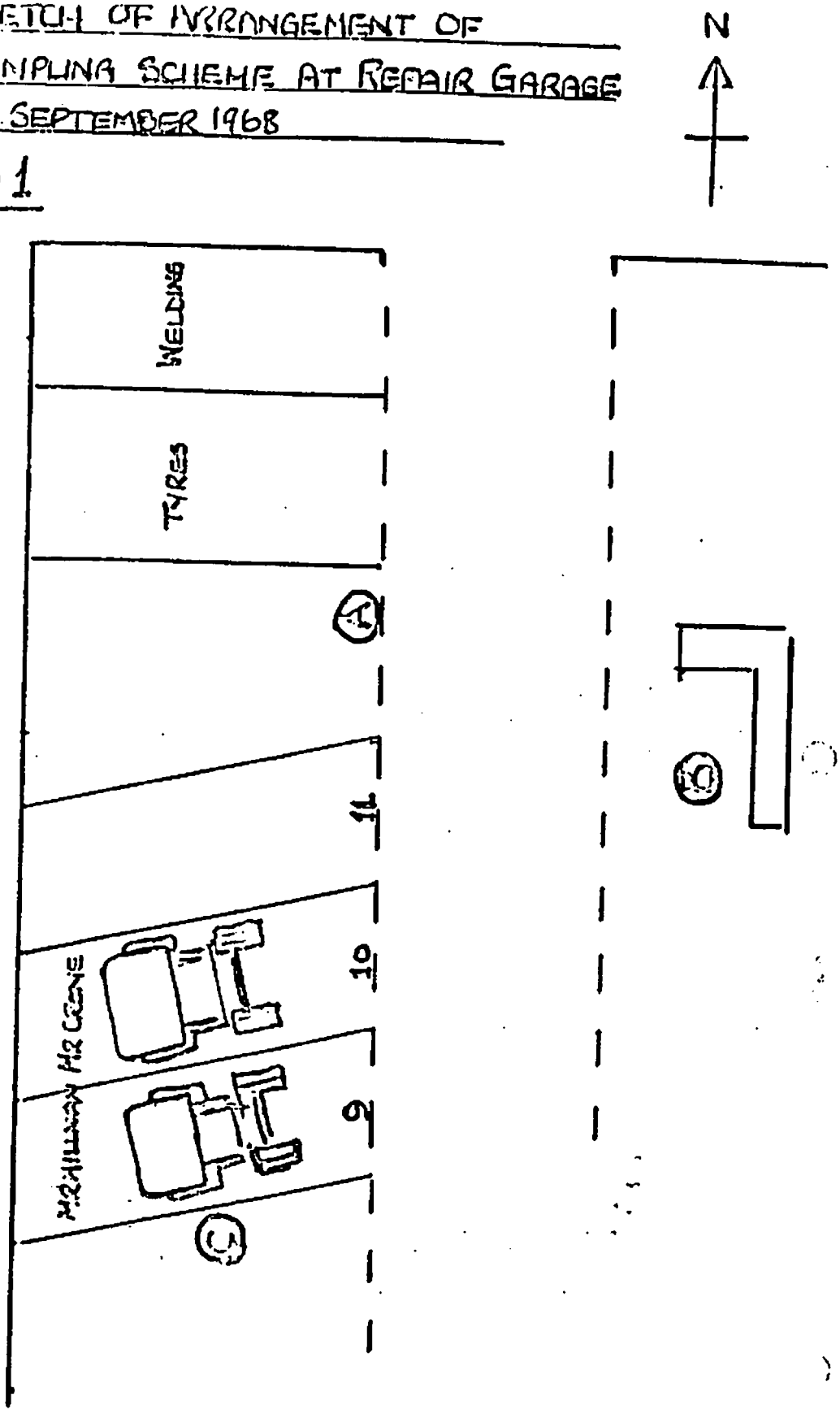
Table 1. Results of Membrane Filter Counts

Sample No.	Description	Duration mins.	Flow Rate ml/min.	Concentration fibres/cm^3	Dust Category
1	Personal. Mr Crone. Brake maintenance. Front brakes blown out in this period	99	193	7.09	Medium
2	Personal. Mr Hillman, Clutch repair procedure at adjacent vehicle bay	127	207	2.25	Medium
3	Static. Position A.	190	232	0.17	Neg.
4	Static. Position B.	185	133	0.49	Neg/Low.
5	Static. Position C.	180	206	0.28	Neg.
6	Personal. Mr Crone.One rear brake assembly blown off at beginning of sampling period.	317	180	0.08	Neg.
7	Personal. Mr Hillman. Clutch repair procedure at adjacent vehicle bay.	278	148	0.11	Neg.
8	Static. Position A.	186	211	0.07	Neg.
9	Static. Position B.	186	170	0.11	Neg.
10	Static. Position C.	135	172	0.07	Neg.
	Time-weighted average concentrations:				
	Mr Crone			1.75	Low
	Mr Hillman			0.79	Low

8006 1217

SKETCH OF ARRANGEMENT OF SAMPLING SCHEME AT REPAIR GARAGE 19. SEPTEMBER 1968

Fig 1



Report 43/69

8006 1218 PQ

Correspondence etc
regarding commercial
Dramelere unit

8006 1219

June 5, 1973

Mr W. Hombach D-NM/3GK3
cc: Mr R. Gordon 1/431

Subject: EXPOSURE TO ASBESTOS DURING BRAKE CLEANING

The Ford of Europe Service Department are considering approved equipment for European Dealers including items for the control of the dust produced when brake drums are blown out.

In Ford of Britain there has been some use of items like the Drumclene unit shown on the attached leaflet and we are about to conduct some further tests of their efficiency and of their ability to comply with National legislation.

I should be interested to know whether in Ford of Germany you have legislation which applies to brake-drum cleaning and whether there are any pieces of equipment for dust control which are approved by Government Agencies.

Dr D.J. Hickish
Industrial Hygiene Specialist.
1/163 94-3330.

ENC.

8006 1220 PQ

July 5, 1978

Dr D E Hickish 1/163

cc N R Gordon

Subject: Exposure to Asbestos during Brake Cleaning

A demonstration of the Drumclene brake dust extraction system has been arranged with BT Sales and Services Ltd, the manufacturer of the equipment. It is scheduled for 10.30 on Tuesday, July 11 in the Warley Basement Garage. Please advise the name and extension of the Industrial Hygiene representative who will be attending the meeting.

In addition, we have a prototype equipment from another supplier that can be studied after the Drumclene representative has left.

P J Hinton
European Service
1/451 84:3121

8006 1221

July 17, 1978

Mr P.J. Hinton 1/451

cc: Mr N. Gordon 1/451

Subject: EXPOSURE TO ASBESTOS DUST DURING BRAKE CLEANING

As requested the demonstration of the Drumclene brake dust extraction system by the B.T. Sales engineer was attended on July 11 1978.

While the engineer was demonstrating the cleaning ability of the equipment on the rear brake assembly of a Cortina, a high intensity light beam, as described in the Schedule of the Certificate of Approval No. AP 1 2363 of the Asbestos Regulations 1969, was used to assess the containment of the dust by the equipment.
No dust was seen to escape from the equipment during the cleaning, indicating that there should be no hazard to health if this equipment goes into service in the dealerships.

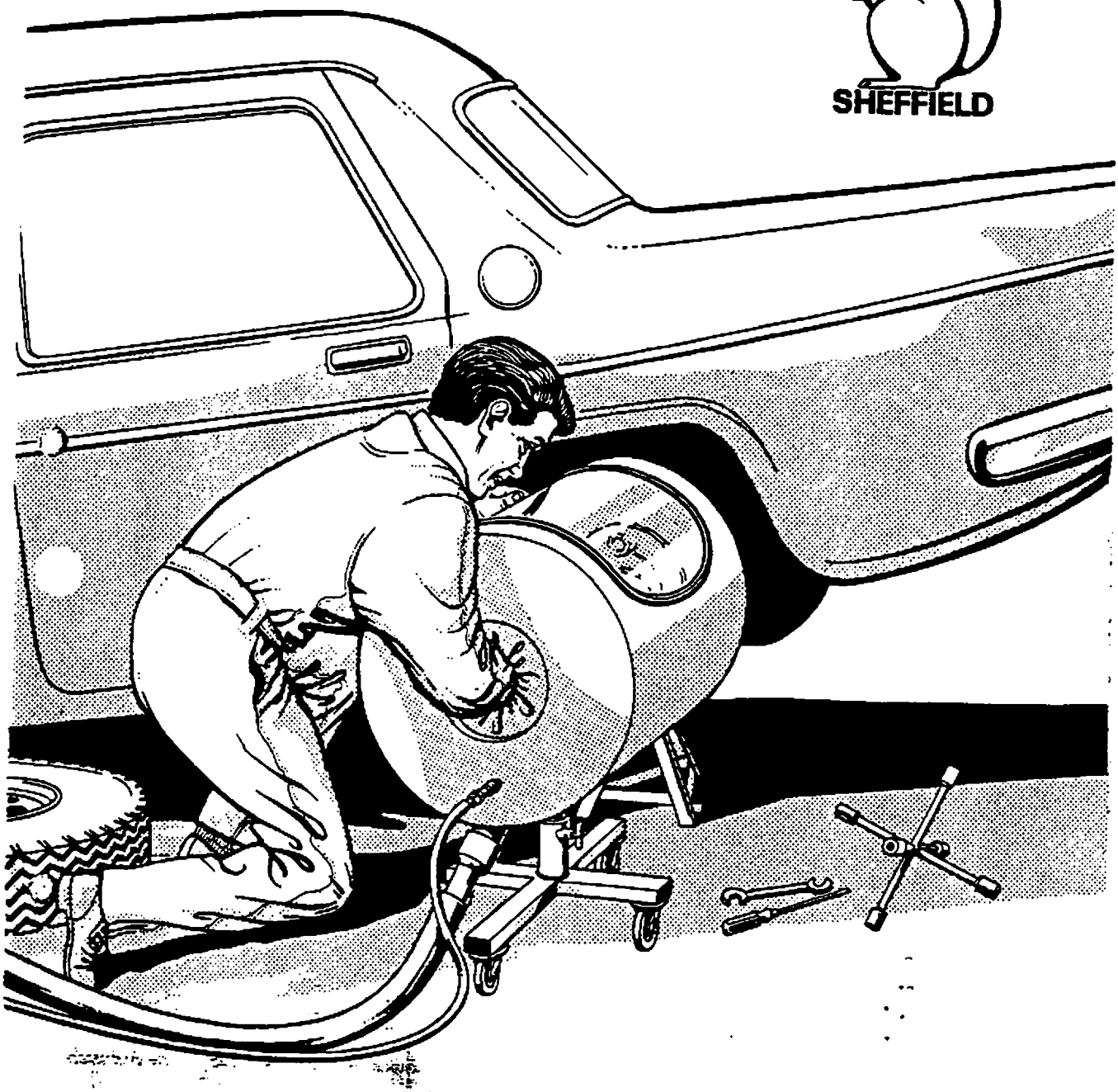
A.J. Crocker
Industrial Hygiene Analyst.

1/163 34-2452

8006 1222 PQ

B.T. SALES & SERVICE LTD.

SHEFFIELD



B.T. 'DRUMCLENE'

MK II

8006 1223

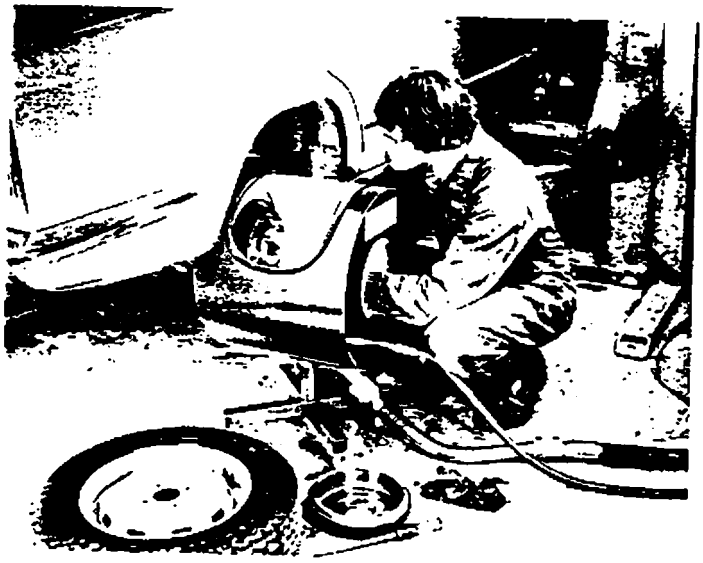
The B.T. 'DRUMCLENE'

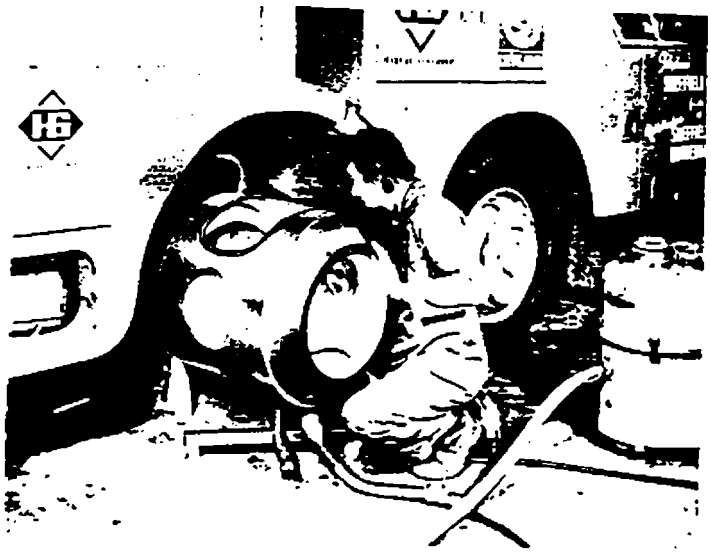
With a view to reducing the health hazard from dust and asbestos particles when cleaning out vehicle drum brake assemblies we are proud to offer our range of 'Drumclene' Equipment as illustrated herein.

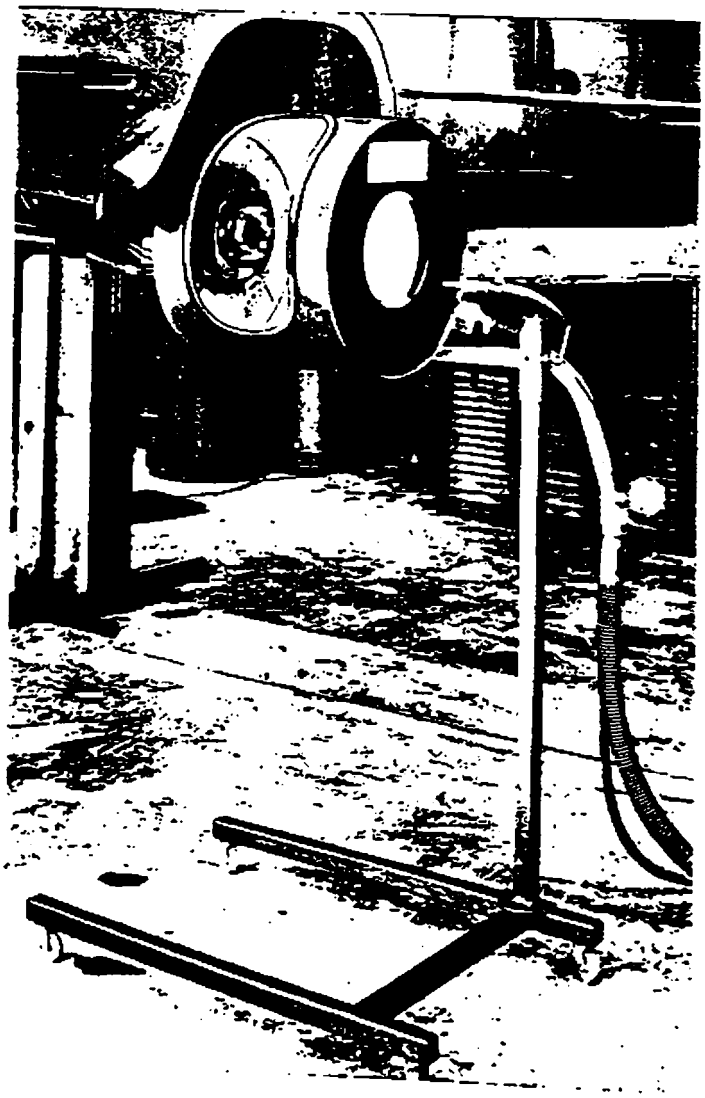
'Drumclene' enables the effective method of Air Blast Cleaning to be employed in total safety.

The 'Drumclene' is a light-weight steel cylinder, spigot mounted on to a detachable sub-frame which is fitted with fully rotating castors.
The spigot attached to the base of the cylinder is 1¼" diameter which enables the 'Drumclene' to be mounted on a standard Trolley Jack for height adjustment if required. Trolley Jack adaptors are available which, when fitted, increase the spigot diameter to 1⅜".
The vehicle end of the 'Drumclene' is partially enclosed by a segmented diaphragm which forms a dust seal behind the backplate of the exposed brake mechanism when the unit is in position.
A fabric sleeve with elastic wrist band enables the operator to handle the press-button air gun inside the unit. Large shatterproof viewing panels are incorporated in both models.

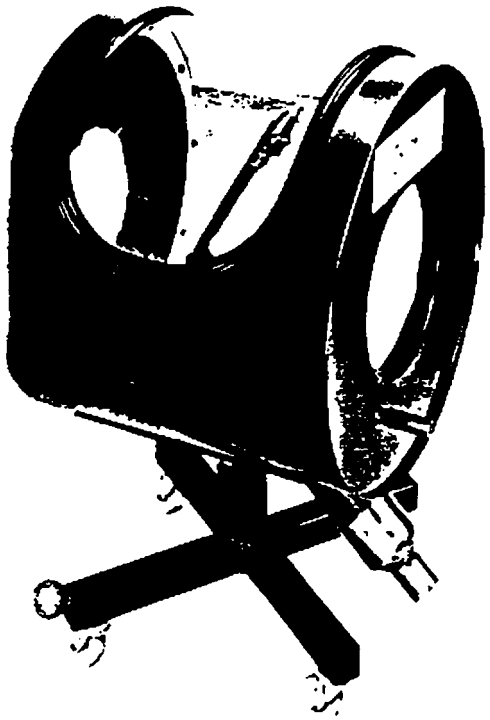
Whilst the unit is complete within itself, it is necessary to connect to a standard air-line supply via the ¼" BSP Socket mounted towards the rear end of the unit.
The blast of air on to the exposed brake mechanism within the 'Drumclene' is sufficient to dislodge the majority of dusts, etc., but in extreme cases it may be necessary to dislodge any solidified matter with a stiff brush. All dust and solids are then drawn through the bottom outlet of the unit, which is designed to accept most Industrial Suction Cleaner hoses up to 2¾" bore by use of the push-fit reducing adaptor supplied.
Suction Cleaner specifications are noted on the opposite page, but whatever their capacity we recommend the u... of a type having bag collection and additional filtrati... suitable for handling dust and asbestos particles.





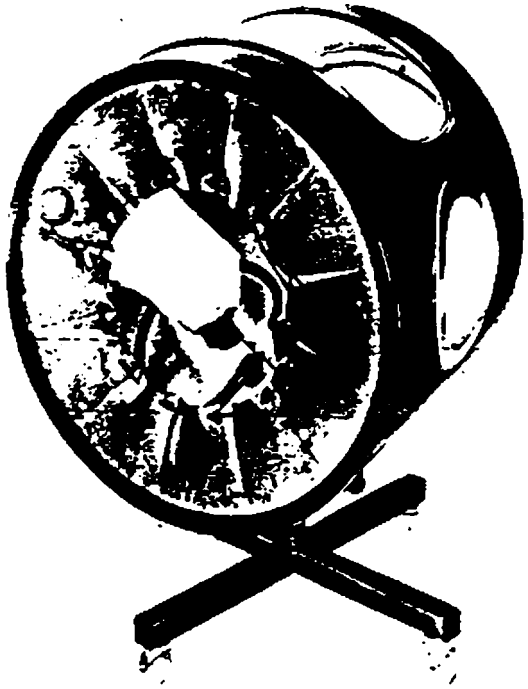


8006 1224



This model is designed to accommodate a wide range of vehicles with drum brakes in the 7" to 12" diameter range.
A single sleeve situated in the rear end of the cylinder enables the operator to complete the cleaning process with efficiency and safety.
In some cases, drum brakes are serviced and cleaned whilst the vehicle is in an elevated position, i.e. on a vehicle lift. In these cases we recommend the use of a high-lift stand (Part No. BT200/175), as illustrated on the opposite page.
Whilst the general requirement of a suction cleaner is outlined in the introductory paragraph it is essential that for use with the BT200 the cleaner must have, in addition to filtration etc., a minimum airflow of 50 CFM with its hose connected.

B.T. 200



Designed for use on the larger diameter drum brakes found on commercial vehicles etc. with back plates in the 12" to 19" diameter range.
Two access sleeves are fitted as standard to this model, but if necessary a third sleeve can be fitted to the centre of the circular rear window. If ordered with this sleeve fitted the model number becomes BT 416.
This third sleeve affords additional access when the 'Drumclene' is used on drum brakes of greater depth than standard, e.g. Double Wheel Assemblies.
In some cases it has been found that Fleet users only handle a specific drum size, for example 17" diameter. In these instances we are able to offer special size diaphragms solely for Fleet use.
It will be appreciated that a suction cleaner for use with the BT400 has to have a larger air-flow than that used on the smaller model, therefore we recommend a cleaner capacity of 95/100 CFM in addition to the filtration requirements mentioned previously.

B.T. 400

BRITISH PRODUCTS

Spare Parts List

Description	Spare Part Code Number BT200	BT400	BT200 MKII	BT400 MKII
Top Window	BT200/101	BT200/101	BT200/120	BT200/120
Sealing Strip, Top Window	—	—	BT200/121	BT200/121
Rear Circular Window	—	BT400/101	—	BT400/125
Sealing Strip, Rear Circular Window	—	—	—	BT400/126
Rear Window, C/W 3rd Sleeve	—	BT400/116	—	BT400/116
Fabric Sleeve	BT200/102	BT200/102	BT200/102	BT200/102
Sleeve Retaining Clip	BT200/103	BT400/103	BT200/103	BT400/103
Castor	BT200/111	BT200/111	BT200/111	BT200/111
Thumb Screw $^{5}/_{16}$" W	BT200/113	BT200/113	BT200/113	BT200/113
Diaphragm Complete	BT200/115	BT400/115	BT200/115	BT400/115
Air Line Assembly	BT200/108	BT400/108	BT200/108	BT400/108
Outlet Reducer	DG271	DG271	DG271	DG271
Diaphragm Elastic C/W Clip	BT200/105	BT400/105	BT200/105	BT400/105

When ordering spares please quote Description and Part Number

B.T. SALES & SERVICE LTD. SHEFFIELD

B.T. Sales & Service Limited

Huntingtower Road Sheffield S11 7GR
Telephone 685021 & 661424 (STD 0742)

Agent's Name and Address